THE WORLD BOOK ENCYCLOPEDIA

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INSTITUTE OF EDUCATION FOR WOMEN
Dept. of Extension
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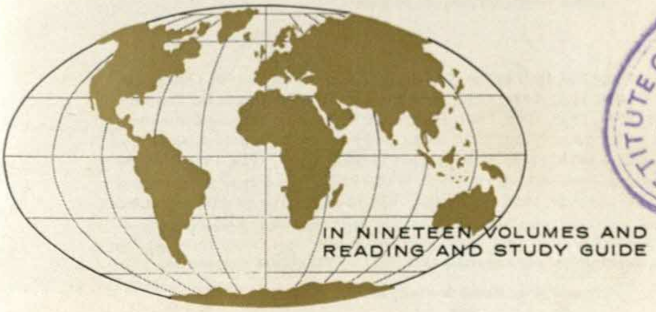

IN NINETEEN VOLUMES AND
READING AND STUDY GUIDE

FIELD ENTERPRISES EDUCATIONAL CORPORATION
Merchandise Mart Plaza · Chicago 54 · Illinois

THE WORLD BOOK ENCYCLOPEDIA

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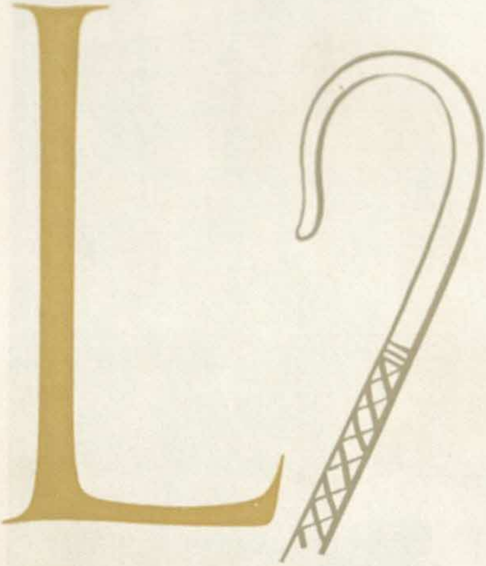
Ll is the 12th letter of our alphabet. It was also a letter in the alphabet used by the Semites, who once lived in Syria and Palestine. They named it *lamed*, their word for *goad*, or *crooked staff*. They adapted an Egyptian hieroglyphic, or picture symbol, for goad, to represent the letter. The ancient Greeks took the letter into their alphabet and called it *lambda*. Later, the Romans borrowed it from the Greek alphabet and gave the letter its present capital L form. See ALPHABET.

Uses. *L* or *l* is the 11th most frequently used letter in books, newspapers, and other printed material in English. *L* is the Roman numeral for *50*. When it is written with the crossbar, as £, it is the sign for pound in English money, and comes from the Latin word *libra*, or *pound*. In physics, *L* stands for *length*, as it does in most measurement formulas. In geography, *L* indicates *longitude*, and *l* stands for *latitude*. The *l* also stands for *lira* in Italian money; for *leaf* in describing books, and for *left* as in *l.f.*, or *left field;* and for *lower* as in *l.c.*, or *lower case*, a term used in typography and journalism.

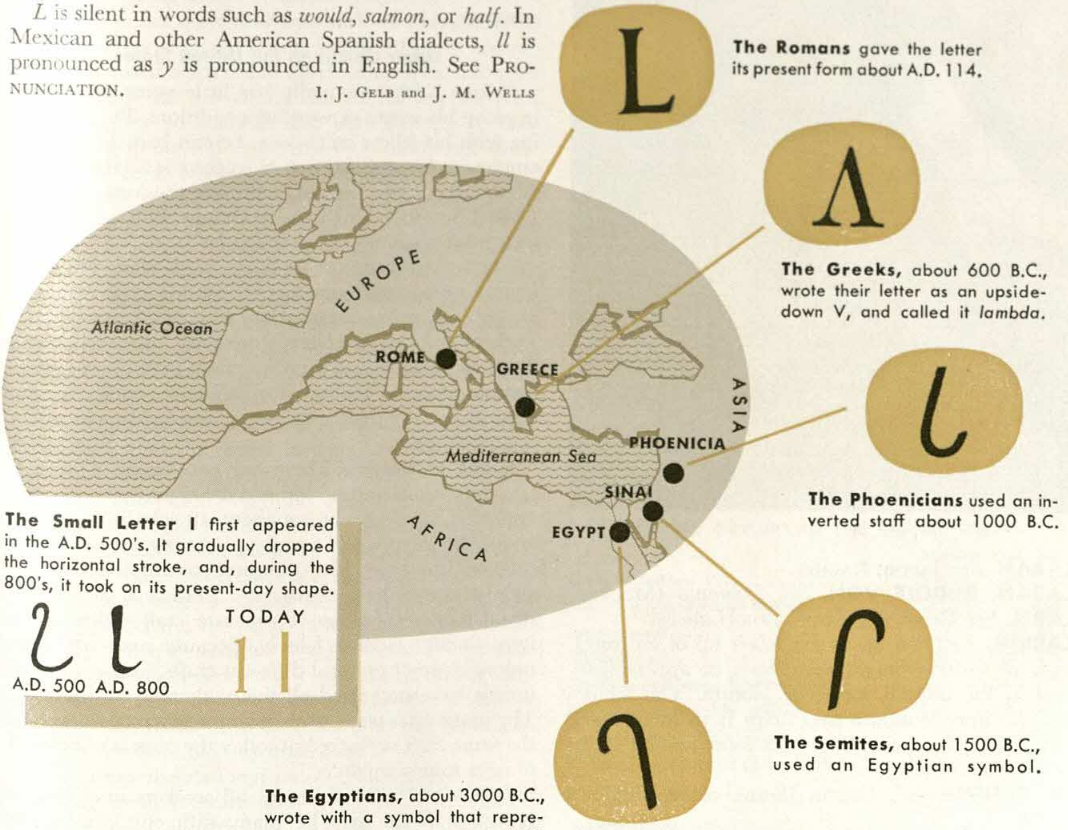
Pronunciation. In English, a person pronounces *l* by placing his tongue on the edge of his lower front teeth and with its sides free. His velum, or soft palate, is closed, and he vibrates his vocal cords with his breath.

L is silent in words such as *would*, *salmon*, or *half*. In Mexican and other American Spanish dialects, *ll* is pronounced as *y* is pronounced in English. See PRONUNCIATION.

I. J. GELB and J. M. WELLS



The 12th letter took its shape from a symbol used in ancient Egypt to show a goad. Its sound came from the Semitic word *lamed*, which means *goad or crooked staff*.



The Romans gave the letter its present form about A.D. 114.

The Greeks, about 600 B.C., wrote their letter as an upside-down V, and called it *lambda*.

The Phoenicians used an inverted staff about 1000 B.C.

The Semites, about 1500 B.C., used an Egyptian symbol.

The Egyptians, about 3000 B.C., wrote with a symbol that represented a goad or crooked staff.

The Small Letter l first appeared in the A.D. 500's. It gradually dropped the horizontal stroke, and, during the 800's, it took on its present-day shape.

LABOR

Delta Air Lines

LABAN. See Jacob; Rachel.

LABAN, RUDOLF VON. See Dancing (Modern).

LABEL. See Consumer Education (Labels).

LABIUM, *LAY bih um,* is the lower lip of an insect. A pair of *maxillae* (membrane bones or appendages), joined in the middle, form the labium. The labium closes the insect's mouth and helps it to retain food. It also helps the insect move its food around in its mouth while chewing.

LA BOHÈME. See Opera (Some of the Famous Operas).

LABOR means *work.* It is the way people make a living and provide food, clothing, and shelter for their families. Labor also means the men and women who work for wages. In this sense, labor includes pilots guiding their airplanes through the skies, coal miners working deep in the earth, steelworkers pouring out great streams of molten metal, and department store clerks waiting on their customers. Labor also means *labor unions,* when, for example, newspaper headlines announce that "Labor Strikes For Higher Pay."

Labor—workers and their unions—has become one of the most important economic forces in the world. At one time, most men farmed their own land, and labor consisted of small groups of blacksmiths, shoemakers, and other craftsmen. During the Industrial Revolution, factories and mines needed large numbers of workers, and laborers came from the farms. The early factory and mine owners often ignored the welfare of their employees. So the workers of the 1800's organized unions and sought to better their wages and working conditions.

Labor had a different development in the United States than it did in other countries. In most countries, labor unions founded political parties. These parties usually aimed at gaining control of the factories and mines. In the United States, only a few groups of workers have founded political parties. In general, labor in the United States expresses its political aims through the great national political parties. Similarly, the labor movement in the United States seeks to achieve economic reforms within the existing free-enterprise system. Because of this development, labor unions in the United States stand out as markedly different from the labor movements in most other countries.

Labor Unions in the United States

A lone worker normally has little voice in helping improve his wages or working conditions. But, by joining with his fellow employees, he can bargain with his employer. An organization of workers is a labor union. About 18,000,000 persons, a third of the workers in the United States, belong to labor unions. But unions have won most outstanding advances for labor.

The strongest unions are in the fields of construction, entertainment, manufacturing, mining, printing and publishing, and transportation. In general, agricultural workers and "white-collar" employees in such fields as banking, finance, and insurance have little union organization. Many agricultural workers, such as fruit pickers, migrate from one job to another, and rarely join union organizations.

Kinds of Unions. There are two kinds of unions: (1) craft unions and (2) industrial unions.

Craft Unions usually represent all jobs in a certain craft. The members of a craft union may work in many different industries. Most groups of construction workers, such as carpenters, electricians, plumbers, and sheet-metal workers, belong to separate craft unions. The term "craft" is used loosely, because many of these unions represent several different crafts, and some craft unions have organized all the workers in an industry. The name *trade union* once meant a union of workers in the same craft or trade, but today the term is often used to refer to any union.

Industrial Unions represent all workers in a certain industry. There may be many different jobs in the industry, but the union represents all the workers. Automobile workers, mine workers, and steelworkers have industrial unions. Actually, most industrial unions represent workers in more than one industry. For example, the automobile workers' union represents workers in the automobile, aircraft, agricultural-implement, and some metalworking industries.

Union Organization. There are three levels of union organization: (1) the local union, (2) the national or international union, and (3) the federation.

Local Unions, or "locals," usually represent groups of workers in a certain area, such as a city or a county. For example, all the plumbers in a city may belong to one local, and all the steelworkers may belong to another. Sometimes a local may cover a larger territory, such as a state, or a much smaller area, such as part of a city. Some unions have many locals and others have only a few.

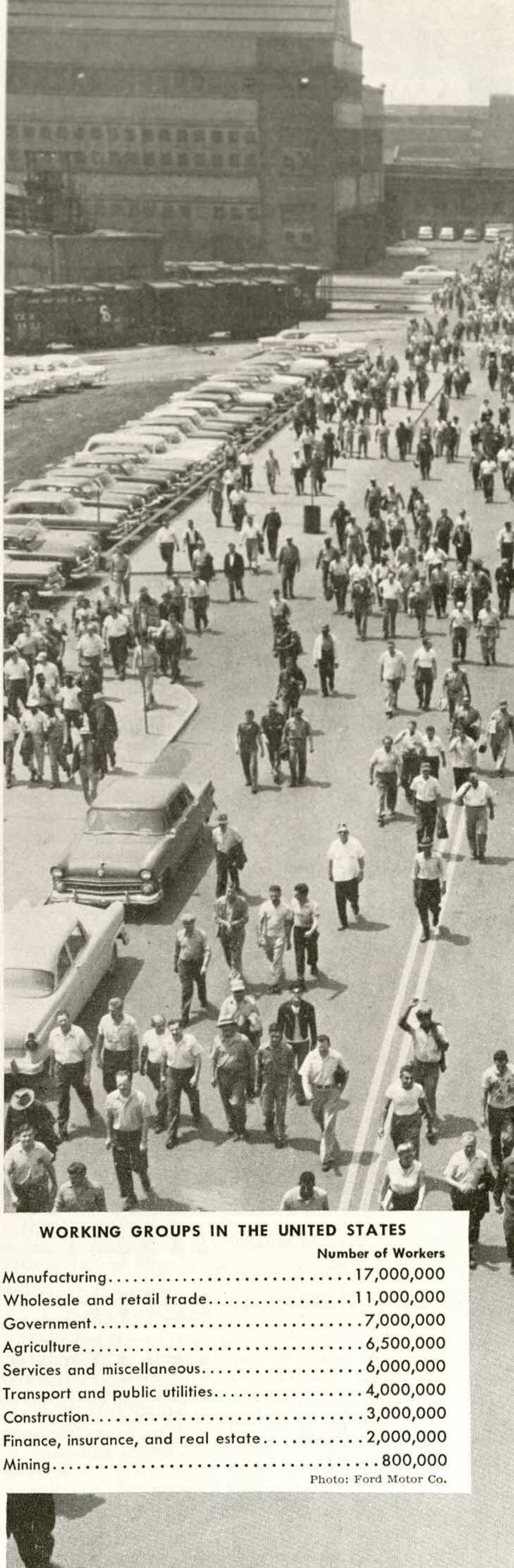
Local unions usually have headquarters or halls for meetings. Many of these buildings serve as clubhouses for the members. The members govern the local at meetings, usually held every month. The members elect officers every one or two years. If the local is large and has enough money, it may have one or more paid, full-time officers called *business agents*. But most local unions cannot afford full-time officers. They elect an executive board that includes a president, a secretary, and a treasurer. These men carry out their union duties in addition to their regular jobs. The union members of a division in a company usually elect a member called a *steward* to represent them with the company's management. In a large company, there may be a number of stewards working under a chief steward.

If a union has more than one local in a certain area, the locals may organize a *joint board, district*, or *council*. The joint board helps the locals combine their resources and strength in the area. The locals usually elect representatives to manage the joint board. It may become an important center for the union's activities.

National or *International Unions*. Local unions in a certain craft or industry join together in a national union. Many of these unions are called *international*, because they also have locals in Canada and other areas. They supervise the most important union job, *collective bargaining*. This means reaching an agreement with employers concerning wages, hours, and working conditions. In addition, the national union handles organizing (recruiting new members), promoting laws helpful to labor, public relations, and problems of education, health, and welfare. Many national unions have permanent staffs, including lawyers and other consultants, and attractive headquarters buildings.

A convention held every one, two, or four years governs most national unions. A labor union convention resembles a political convention. It includes committee meetings, debates, speeches, roll calls, and guest speakers. Local unions send delegates to the convention. The convention decides the broad policies of the union and elects the union's executive officers. These officers and an executive committee carry out union policy and supervise bargaining with employers. In several unions, important decisions must be referred to the locals and approved by the union membership.

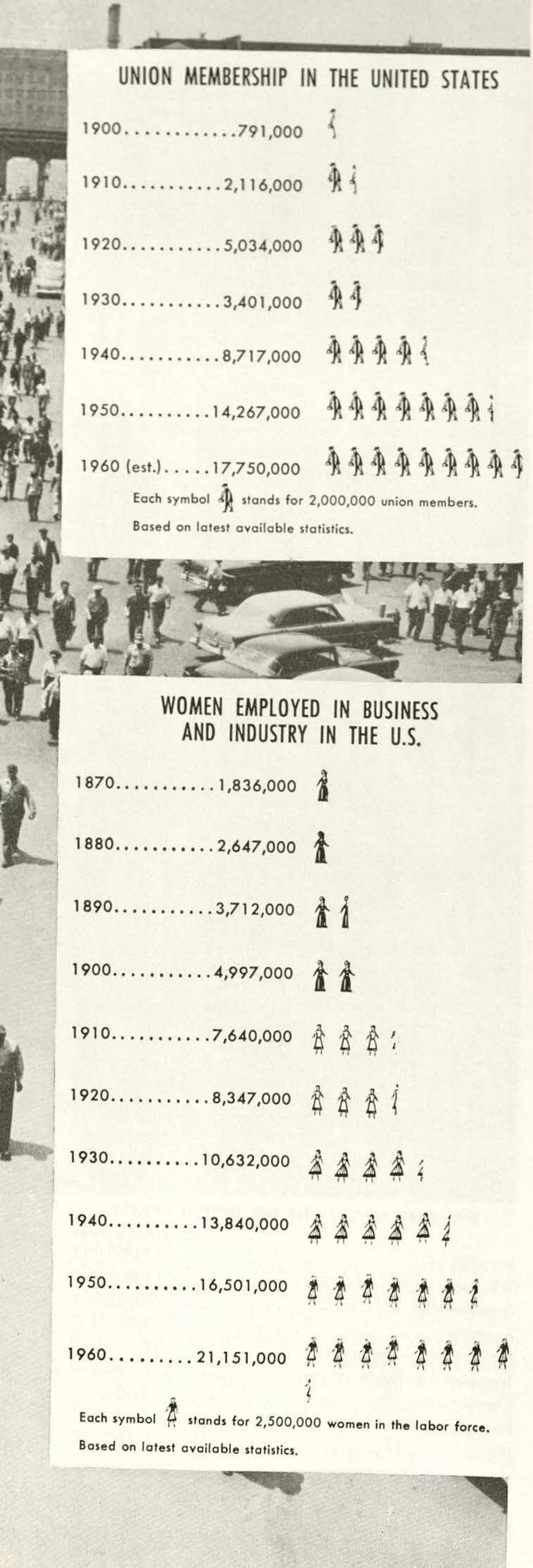
In general, the national union controls its locals. It can bring great pressure on a local, and can expel it from the union if necessary. Control depends on the



WORKING GROUPS IN THE UNITED STATES

	Number of Workers
Manufacturing	17,000,000
Wholesale and retail trade	11,000,000
Government	7,000,000
Agriculture	6,500,000
Services and miscellaneous	6,000,000
Transport and public utilities	4,000,000
Construction	3,000,000
Finance, insurance, and real estate	2,000,000
Mining	800,000

Photo: Ford Motor Co.



UNION MEMBERSHIP IN THE UNITED STATES

1900............791,000
1910...........2,116,000
1920...........5,034,000
1930...........3,401,000
1940...........8,717,000
1950..........14,267,000
1960 (est.).....17,750,000

Each symbol stands for 2,000,000 union members.
Based on latest available statistics.

WOMEN EMPLOYED IN BUSINESS AND INDUSTRY IN THE U.S.

1870...........1,836,000
1880...........2,647,000
1890...........3,712,000
1900...........4,997,000
1910...........7,640,000
1920...........8,347,000
1930..........10,632,000
1940..........13,840,000
1950..........16,501,000
1960.........21,151,000

Each symbol stands for 2,500,000 women in the labor force.
Based on latest available statistics.

kind of industry in which the union operates. Workers in some industries, such as automobiles, clothing, and steel, make products in certain sections of the United States, but these products are sold in all parts of the country. Usually, in such cases, the national union closely supervises collective bargaining. This supervision prevents one local from accepting a poor bargain from an employer, and thereby lowering the standards of other locals. In other industries, such as construction, the companies employing union workers usually compete on a local market, rather than a national one. Here the national union allows the local union considerable freedom in bargaining.

Federation. The American Federation of Labor and Congress of Industrial Organizations (AFL-CIO) is a federation of national and international unions. Of the nearly 18,000,000 union members in the United States, about 13,500,000 belong to unions affiliated with the AFL-CIO. Not all national unions belong. For example, the United Mine Workers and several railroad unions are not members of the federation.

The AFL-CIO has five major activities: (1) to work for laws favorable to labor and general welfare; (2) to help organize workers who are not in unions; (3) to settle disputes and encourage friendly relations among member unions; (4) to take part in the world labor movement through the International Confederation of Free Trade Unions, an association of unions from all parts of the noncommunist world; and (5) to help educate union members and the general public on the aims of organized labor. The AFL-CIO has little to do directly with collective bargaining.

A convention held every two years governs the AFL-CIO. National unions send delegates in proportion to their membership. Between conventions, an *executive council*, *executive committee*, and *general board* govern the AFL-CIO. The president and secretary-treasurer belong to all three governing bodies. The AFL-CIO has headquarters in Washington, D.C. See AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS (AFL-CIO).

Union Dues. Every union member pays dues that average from $3 to $4 a month to support his union. The local union collects the dues, keeps part of the money, and sends the rest to the national union. The national union, in turn, keeps part of the money and pays the AFL-CIO a small amount for each member. Some unions have *checkoff* agreements with employers. In the checkoff, the employer deducts union dues from the worker's pay and gives the money to the union. The Labor-Management Relations Act of 1947 states that the employer must have the written consent of the worker before he can collect union dues.

Union Aims. In general, the unions try to get workers the highest wages possible. This means that they try to improve the *wage rate*, the amount of money a worker receives for a certain period of time or a certain amount of work. Some companies must frequently stop production and lay off many of their employees. For example, automobile manufacturers must usually close their plants while they prepare the machinery to produce new models. Some unions have obtained a *guaranteed wage* from these employers. This is an arrangement in which the company agrees to pay its workers all or part of their regular wages even if its plant is closed. The unions have also sought a shorter working week, more paid holidays, and longer vacations.

But higher wages and shorter hours are not the only union aims. Many jobs can be dirty, monotonous, and dangerous. For example, in many coal mines there is always danger of fires and cave-ins. The unions try to achieve improved working conditions, and cooperate with employers on safety programs in mines and factories. Because their organization is basically democratic, the unions offer the worker a voice in his craft or industry. The unions also sponsor dances, picnics, sports, and many other activities. They speak for labor in community affairs and try to educate their own members in their duties as citizens. They promote legislation that will help labor. Many unions give scholarships to needy boys and girls. The unions also try to look after the welfare of their members. For example, if a worker becomes ill or dies, the union helps care for his family.

Labor-Management Relations

Company executives and union representatives have worked out regular ways of settling their disagreements. They call these methods *labor-management relations*. They solve many problems through discussion and negotiation. The most publicized labor-management relations—strikes and lockouts—are extreme measures. Labor-management relations are sometimes called *industrial relations* (see INDUSTRIAL RELATIONS).

Management Aims. The job of a company's executives, or management, is to make profits for its owners or stockholders. But most company managements also want to help their employees as much as possible. Many companies have introduced profit-sharing plans and the sale of company stock to employees (see PROFIT SHARING). Company pension plans may add as much as $60 a month to a worker's social-security benefits when he retires. About 31,000,000 workers and their 45,000,000 dependents have health and welfare insurance introduced by their companies. Some firms pay the entire cost of the program. Many companies have shorter working hours than those set by law. They have developed various ways to make work more attractive, such as redecorating drab working areas and providing recorded music. These practices do not appear in a worker's pay envelope, but they have real and important value to the employee.

In general, management does not like union interference with its workers. Many political leaders and businessmen oppose union membership as a condition of employment. In some areas, management has taken elaborate precautions to prevent union organization. But, in spite of disagreements, management and labor have seen that each has a vital role in a free economy.

Collective Bargaining is one of the most important forms of labor-management relations. Representatives of a company and a union meet to talk over wages, hours, and other problems. In a typical meeting, the union makes certain demands and the management makes counteroffers. The two sides then try to work out an agreement. Each side usually has to concede something. Sometimes the meetings go on day and night for days or even weeks.

The representatives of labor and management put their agreements in the form of a written *contract*. This contract states how long the agreement will last, and describes in detail all arrangements affecting wages, hours, and other issues. One important part of a contract deals with *union security*. In general, union security means that a company agrees to require union membership as a condition of employment.

Everyday Relations. A contract cannot cover every problem that may arise in a company's daily operations. Labor and management have worked out procedures for dealing with these problems.

If a worker has a grievance, or complaint, he talks to the steward who represents the union in his department. Together they talk to the worker's *foreman*, who represents management. Most problems end at this level. But if these men cannot solve the problem, it goes to a union chief steward and a general superintendent who represents management. If the problem still cannot be solved, it may go to the union's grievance committee and the company's personnel director or the executive in charge of employee relations. After that, the company and the union may decide to ask a neutral third party to rule on the issue.

In many smaller companies, a problem can often be solved by the employer or foreman and a representative of the union. Sometimes the union's business agent can help settle minor disputes. See ARBITRATION.

Strikes and Lockouts. A company or a union may take direct action if a serious dispute, such as one over a

LABOR TERMS

***Blacklists** are lists made by employers of undesirable workers.

***Boycott** occurs when a labor union tries to persuade people not to buy a product, or to persuade workers not to have any dealings with an employer involved in a labor dispute.

Checkoff means the collection of union dues by the employer. Workers authorize the company to deduct dues from their pay and give the money to the union.

***Closed Shop** exists in a company that is required by contract to hire only union members.

Featherbedding is the practice of making an employer pay for workers who do little or no work.

Fringe Benefits include paid holidays and vacations, pensions, and health funds.

Kickback is the practice of making a worker pay a union official to get or hold a job.

***Lockout** occurs when an employer closes his plant to keep employees from working during a labor dispute.

***Open Shop** exists in a company that does not require its workers to be members of a union.

Runaway Shop refers to a plant that an employer moves to another city to escape union demands.

Scab or **Strikebreaker** is a person who works during a strike called by union workers. The term *scab* may also refer to any nonunion worker.

Slowdown occurs when employees work slowly and reduce production.

***Strike** occurs when employees as a group refuse to work.

***Sweatshop** is a factory or plant with low wages and poor working conditions.

Unfair List is circulated by unions, naming employers who refuse to hire union members, or who violate union conditions for working.

***Union Shop** exists by contract in a company that can hire nonunion workers, but requires them to join a union after they are hired.

***Yellow-Dog Contract** is a pledge required by an employer that a new worker will not join a union.

*Has a separate article in WORLD BOOK.

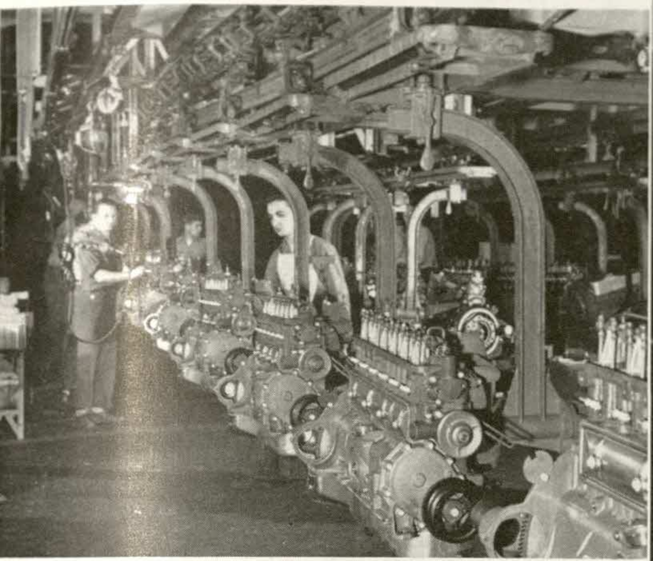
IMPORTANT UNITED STATES LABOR UNIONS

Name	Membership
Actors and Artistes of America, Associated	38,200
Air Line Pilots Association, International	11,000
Allied Industrial Workers of America, International Union	80,000
*Amalgamated Clothing Workers of America	385,000
*Bakery and Confectionery Workers International Union of America (Ind.)	160,000
Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers, Int. Brotherhood of	150,700
Bricklayers, Masons and Plasterers International Union of America	153,600
Bridge, Structural and Ornamental Iron Workers, International Association of	146,900
Building Service Employees Int. Union	230,000
*Carpenters and Joiners of America, United Brotherhood of	850,000
Communications Workers of America	259,000
*Electrical, Radio and Machine Workers, International Union of	397,400
Electrical, Radio and Machine Workers of America, United (Ind.)	100,000
*Electrical Workers, Int. Brotherhood of	675,000
Engineers, Int. Union of Operating	200,000
Federal Employees, Natl. Federation of (Ind.)	98,000
Garment Workers of America, United	40,000
*Garment Workers' Union, Int. Ladies'	450,800
*Hod Carriers', Building, and Common Laborers' Union of America, International	465,900
*Hotel and Restaurant Employees and Bartenders International Union	441,000
Laundry, Cleaning and Dye House Workers International Union (Ind.)	90,000
Letter Carriers, National Association of	108,000
Locomotive Engineers, Brotherhood of (Ind.)	52,800
Locomotive Firemen and Enginemen, Brotherhood of	97,000
Longshoremen's Association, International (Ind.)	52,000
Longshoremen's and Warehousemen's Union, International (Ind.)	70,000
*Machinists, International Association of	949,700
Maintenance of Way Employes, Brotherhood of	225,000
Marine and Shipbuilding Workers of America, Industrial Union of	40,000
Maritime Union of America, National	40,000
Meat Cutters and Butcher Workmen of North America, Amalgamated	310,000
Mine, Mill and Smelter Workers, International Union of (Ind.)	100,000
*Musicians, American Federation of	256,900
Newspaper Guild, American	29,000
Oil, Chemical and Atomic Workers Int. Union	183,000
Packinghouse Workers of America, United	150,000
Painters, Decorators and Paperhangers of America, Brotherhood of	217,000
*Papermakers and Paperworkers, United	130,000
Plumbing and Pipe Fitting Industry of the U.S. and Canada, United Association of Journeymen and Apprentices of the	243,800
Post Office Clerks, National Federation of	97,000
Printing Pressmen and Assistants' Union of North America, International	104,000
Pulp, Sulphite and Paper Mill Workers, International Brotherhood of	165,000
Railroad Trainmen, Brotherhood of	217,500
Railway and Steamship Clerks, Freight Handlers, Express and Station Employes, Brotherhood of	350,000
Railway Carmen of America, Brotherhood	129,800
Retail Clerks International Association	300,000
Retail, Wholesale and Department Store Union	117,000
Rubber, Cork, Linoleum and Plastic Workers of America, United	178,000
State, County and Municipal Employes, American Federation of	150,000
*Steelworkers of America, United	1,250,000
Street, Electric Railway and Motor Coach Employes of America, Amalgamated Assoc. of	143,700
*Teachers, American Federation of	50,000
*Teamsters, Chauffeurs, Warehousemen and Helpers of America, International Brotherhood of (Ind.)	1,368,100
Telegraphers' Union, The Commercial	32,000
*Telephone Unions, Alliance Independent (Ind.)	100,000
Textile Workers of America, United	100,000
Textile Workers Union of America	202,700
Tobacco Workers International Union	34,700
Transport Workers Union of America	130,000
*Typographical Union, International	99,200
*United Automobile, Aircraft and Agricultural Implement Workers of America, International Union	1,320,500
*United Mine Workers of America (Ind.)	—
Utility Workers Union	83,400
Woodworkers of America, International	98,500

*Has a separate article in THE WORLD BOOK ENCYCLOPEDIA. Union is AFL-CIO affiliate unless indicated as Independent (Ind.).

contract, cannot be settled through discussion. The company may close its plant so that employees cannot work until the dispute is settled. Closing the plant is called a *lockout* (see LOCKOUT). On the other hand, the union may order its members not to work. Refusing to work is called a *strike*. In most cases, the workers vote to call a strike or allow their representatives to call a strike if the representatives think it is necessary (see STRIKE). Both strikes and lockouts come under the Labor-Management Relations Act of 1947. This law requires that if either a company or a union wants to end a contract, an action which could cause a strike or lockout, it must notify the other party 60 days in advance. The 60 days offers a "cooling-off" period. After 30 days, the union or company must notify a state and federal board that can help to settle the dispute. In case of a nationwide strike, the Attorney General of the United States may apply for a federal court order to stop the strike for 80 days if he believes that it will endanger the national welfare.

When workers strike or are locked out, they may surround the plant with a *picket line*. Pickets usually walk back and forth around the company buildings. They carry signs that call the public's attention to the strike or lockout. Unions set up picket lines in an attempt to discourage the public from doing business with the company, and to turn away other workers. Members of



Ford Motor Co.

Assembly Lines are one of the most important features of labor today. Mechanical arms lift and move heavy parts, leaving workers free to concentrate on precision details.

Automation involves using one machine to regulate the work of other machines. An automated factory needs only a small labor force, but it must have well-trained workers.

nonstriking unions often refuse to cross the picket lines.

There are various kinds of strikes. An *economic strike* results from disagreements over wages, hours, or working conditions. *Unfair-labor-practice strikes* are protests against employers whom the union claims have violated part of the Labor-Management Relations Act of 1947. A union goes on a *sympathy strike* to help striking workers in another company or industry. A *wildcat*, *outlaw*, or *quickie strike* is one that is not authorized by the union. Wildcat strikes usually last only a short time. They may occur when workers protest the dismissal of a friend or when union officials, without consulting the union members, agree to a contract that the workers disapprove.

Human Relations. Friction between labor and management, or among the workers themselves, can hurt morale, and this can slow down production. Many companies have *human-relations experts* to handle these problems. For example, a worker may not produce as much as he is able because of improper supervision. The human-relations expert may develop training programs for supervisors to show them how to get along better with their workers.

Labor and Government

Government—federal, state, and local—often helps settle labor disputes and supervise working conditions. There are important federal and state agencies and laws that deal with labor problems.

The Federal Government takes a direct interest in almost all phases of labor's problems. The United States Department of Labor, created as a bureau in 1884, deals with many labor questions, but emphasizes aid to the individual worker. For example, it supervises an employment service throughout the country that helps persons to get jobs (see LABOR, DEPARTMENT OF). The National Labor Relations Board conducts elections among employees to determine whom the employees want to represent them in collective bargaining (see NATIONAL LABOR RELATIONS BOARD).

Retirement faces every worker as he grows older. How will he be able to support himself when he can no longer work? The federal government deals with this problem, rather than the unions or management, although many companies have pension plans. The social-security system, created in 1935, provides Old Age, Survivors, and Disability Insurance. See PENSION; SOCIAL SECURITY.

The most important federal law dealing with labor disputes is the *Labor-Management Relations Act of 1947*, usually called the *Taft-Hartley Act*. This law replaced the *National Labor Relations Act of 1935*, usually called the *Wagner Act*. The Wagner Act pioneered in federal regulation of labor-management problems. It guaranteed the rights of workers to organize unions, bargain with employers, and choose their bargaining representatives—that is, their unions. It defined a number of unfair labor practices. These included penalizing workers for belonging to unions, interfering in the administration of a union by employers, and giving money to a union by employers. The Taft-Hartley Act guaranteed the same general rights, but emphasized the right of a worker *not* to join a union if he should so choose. It outlawed the *closed shop*, an agreement in which an employer agreed to hire only union members. It also

LABOR IN THE MIDDLE AGES

Guilds of skilled workers and artisans grew up during the Middle Ages. They set standards for materials, workmanship, and prices.

Apprentices learned their trades from masters. They became journeymen, and could become masters by meeting guild requirements.

Brown Bros.

required that if union leaders want the National Labor Relations Board's help, they must file administrative and financial statements of their unions with the Board, and must certify that they are not communists.

The Labor-Management Reporting and Disclosure Act of 1959 or *Landrum-Griffin Act* required unions to submit regular financial reports to the Secretary of Labor. The law established new standards for union elections, and prohibited secondary boycotts and picketing for union recognition. The *Fair Labor Standards Act of 1938*, usually called the *Wages and Hours Act*, defined minimum wages, overtime, and child-labor standards for employers engaged in interstate commerce. The *Anti-Injunction Act of 1932*, usually called the *Norris-La Guardia Act*, prohibited certain kinds of federal injunctions against unions.

State Governments. In general, the states allow their courts to act in certain kinds of disputes between labor and management. Every state has a bureau or agency that deals with labor problems. Most of these bureaus gather and publish information and statistics on labor within the states. State labor laws are particularly important in the fields of safety and health. The states have regular systems of inspecting factories and mines to make sure that they meet safety and health regulations. All states have *workmen's compensation laws* to protect workers from loss of income due to injuries on the job (see WORKMEN'S COMPENSATION).

History

In Ancient Times, labor was closely related to slavery. Victorious nations often made slaves of the prisoners they captured in war. Many thousands of persons were born into slavery.

Ancient Athens became the first great democratic society, but it always had slaves. In the 400's B.C., Athens had 115,000 slaves in a total population of 315,000. The Greek philosopher Aristotle described a slave as "a tool with life in it."

The Roman Empire also relied heavily on slaves. Slaves in Greece and Rome could gain positions of great responsibility in many households, and many won or bought their freedom. But labor, particularly manual labor, had a low rank in society. See SLAVERY.

In the Middle Ages, labor gained dignity and respect as slavery declined and Christianity spread. By the A.D. 1100's and 1200's, skilled workers formed *craft guilds* such as those of silversmiths and weavers. The guilds made sure that all products made by their members met certain standards. They also set standards for prices and wages. The guilds established ranks for workers—*apprentice*, *journeyman*, and *master*—that some unions still use today. See GUILD.

The guild system broke down because of its restrictions on memberships and its old-fashioned ideas of producing goods. Most guilds disappeared with the appearance of capitalism that marked the end of the Middle Ages. Capitalism depended on new goods, new methods, and competition. It needed free markets, not only for goods but also for labor.

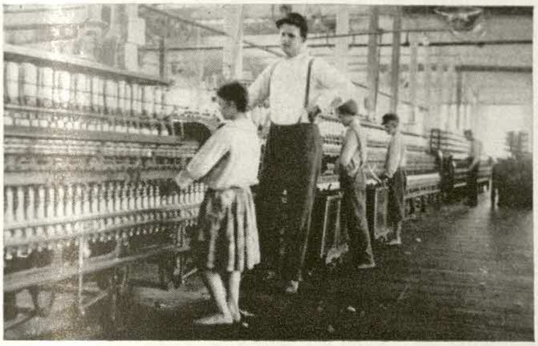
The Industrial Revolution created conditions that led to the modern labor movement. During the 1700's and 1800's, more and more factories appeared in Europe that used machinery to produce goods. These factories needed large numbers of workers, and men and women flocked from farms to find jobs. The new workers created a huge new class in society, the men and women who work for wages in cities and factory towns. See INDUSTRIAL REVOLUTION.

At first, the new workers suffered many hardships—low pay, long working hours, and terrible working conditions. A committee of parliament summed up the situation in Great Britain in 1840: "Food is dear, labor scarce, wages in many branches are low; consequently

THE INDUSTRIAL REVOLUTION

Factory Workers performed tedious jobs under difficult conditions. They often faced dangerous safety hazards.

Child Labor was a harsh product of the Industrial Revolution. Children worked long hours in mines or textile mills.



Brown Bros.

Living Conditions were often harsh for industrial workers. They lived in dark, dingy homes near the mills.

. . . disease and death are making unusual havoc." Workers in Europe and the United States began to form organizations, at first called *combinations,* to protect themselves. Almost every government outlawed combinations because of pressure from wealthy factory owners.

The First Unions in the United States appeared in cities along the East Coast at the time of the Revolutionary War. Isolated groups of craftsmen banded together to improve their wages and working conditions.

One of the first strikes took place in New York City in 1741. Bakers protested against the way the city controlled bread prices, and refused to work. The city tried and convicted them of "combining," but they were not sentenced. Shoemakers in Philadelphia formed the first real local union in 1792. The unions of the 1790's and 1800's bargained with their employers by putting up signs stating the conditions under which they would work. They then concealed themselves near the sign. If the employer rejected their demands, they went on strike by failing to appear for work. Few of these early unions survived the opposition of their employers, the hostility of the courts, and the pressure of hard times.

In the late 1820's, local unions began to form associations. In 1827, workers set up the first union association—the Mechanics Union of Trade Associations—in Philadelphia. The early unions took great interest in local politics. One of the first labor parties was the Workingmen's party, organized in Philadelphia in 1828, to protest lengthening the 10-hour working day.

The first national unions appeared in the 1850's. The International Typographical Union was founded in 1852. The National Union of Iron Molders, now the Molders and Foundry Workers Union, appeared in 1859. Both unions still play important parts in organized labor. But the panic of 1857 dealt union organization a severe blow, because many workers lost their jobs and unions lost their power to bargain.

The major formation of national unions came after the Civil War. The war greatly expanded factory production and railroad building. By 1864, about 300 local unions operated in 20 northern states. City union groups increased in number, and new national unions appeared. A number of city union groups joined in 1865 to form the International Industrial Assembly of North America. In 1866, the group changed its name to the National Labor Union. It became the first important association of unions.

The National Labor Union consisted of local unions, national unions, and trade-union groups. Ira Steward and William H. Sylvis headed the organization. They worked for an 8-hour day, abolition of child labor, and other reforms. But the organization became involved in various political-reform movements, and disappeared by 1872.

The Knights of Labor began as a secret society to improve workers' welfare through peaceful means. It became the first major American attempt to found a union for all workers, both skilled and unskilled. In 1869, Uriah Stephens, a tailor, and eight fellow workers organized the Noble Order of the Knights of Labor in Philadelphia. This society spread from the garment workers to other crafts and industries. But it had little importance until the great railway strikes of 1877. Four eastern railroads cut wages, and strikes broke out immediately. Mobs joined the strikers and troops had to restore order. Dozens died in the riots. After this disaster, many workers joined the Knights of Labor, and it had between 600,000 and 700,000 members in 1886.

The Knights of Labor took part in a number of railroad strikes, and won one of them. This was one of the first union victories. The Knights also demanded an eight-hour day for all workers, and used strikes, bargaining, and boycotts to win local disputes. The "Grand Master Workman" of the society, Terence V. Powderly,

1792 The first local union in the United States represented a group of shoemakers in Philadelphia. But early labor unions could not survive during severe depressions.

1894 The Pullman strike caused an estimated $80,000,000 in property damage alone. President Grover Cleveland ordered federal troops to prevent further violence.

ALL TRADES-ALL CRAFTS-ALL COLORS-ALL CREEDS
-TOGETHER!
AMERICAN FEDERATION OF LABOR & CONGRESS OF INDUSTRIAL ORGANIZATIONS
AFL
CIO

1955 The AFL and CIO merged in 1955, after nearly 20 years of competition, to unite the American labor movement.

AFL-CIO News

RED-LETTER DATES IN AMERICAN LABOR HISTORY

1792 Philadelphia shoemakers organized the first local union.

1799 Philadelphia shoemakers won the first union contract after a 10-week strike.

1825 Tailoresses in New York City organized the first women's union.

1828 Workers organized the first state-wide labor party, the Workingmen's party, in Philadelphia.

1834 Union groups founded the National Trades' Union, the first national labor federation, in New York City.

1842 A Massachusetts court ruled that labor unions were legal.

1866 Union groups organized the National Labor Union, the first important national union association.

1869 Garment workers founded the Knights of Labor in Philadelphia. Carpenters in San Francisco adopted the first union label.

1877 Great national railroad strikes occurred.

1884 Congress set up the Bureau of Labor as part of the Department of the Interior.

1886 Trade union leaders formed the American Federation of Labor (AFL) at Pittsburgh.

1892 Strikers and guards fought at the steel mills at Homestead, Pa. Ten persons died in the struggle.

1894 President Grover Cleveland called out troops to keep order during the Pullman strike in Chicago. Congress made Labor Day a holiday.

1902 Over 145,000 miners in the Pennsylvania anthracite coal fields went on strike.

1913 Congress created the Department of Labor, separating it from the Department of Commerce.

1919 The first great nationwide wave of strikes idled 4,000,000 workers. The Boston police struck, the first strike by government employees.

1922 A coal miners' strike in Herrin, Ill., caused 26 deaths through violence.

1932 The Norris-La Guardia Act limited the use of federal court injunctions in strikes.

1935 Congress passed the National Labor Relations Act (Wagner Act) to protect union rights, and created the National Labor Relations Board.
The Committee for Industrial Organization was organized in Washington, D.C.

1947 Congress passed the Labor-Management Relations Act (Taft-Hartley Act) over President Harry S. Truman's veto.

1955 The AFL and CIO merged.

1959 Congress passed the Labor-Management Reporting and Disclosure Act of 1959.

became one of the most influential men of his time. But the Knights of Labor took more and more interest in political reforms. It came into conflict with the growing craft unions on this point. The conflict caused the decline of the society, and by 1900 it had almost disappeared. See KNIGHTS OF LABOR.

The American Federation of Labor. Craft union leaders, including Samuel Gompers and Adolph Strasser, left the Knights of Labor because it did not seem to represent craft union interests. They formed the Federation of Organized Trades and Labor Unions in 1881. It reorganized in 1886 as the American Federation of Labor (AFL). The AFL was the first national association of craft unions to represent the practical economic interests of its members. Gompers, its leader for over 40 years, insisted that the AFL have no binding political ties.

Violent strikes and lockouts frequently took place, as labor sought to improve wages and working conditions. In addition to using court orders and troops, some companies hired private police forces to put down strikes. In 1886, the Haymarket strikes took place in Chicago over a dispute between labor and the McCormick Harvester Company. Police shot down a number of strikers. In 1892, strikers and guards fought a pitched battle at the Carnegie steel mills near Homestead, Pa., and 10 persons died. In the Pullman strike of 1894, the federal government called out troops to stop violence (see PULLMAN COMPANY).

During its first 30 years, the AFL withstood constant attacks from other labor movements, many of them political in nature. Its chief rivals included Daniel De Leon's Socialist Labor party, Eugene V. Debs' Socialist party, and William Haywood's Industrial Workers of the World (see INDUSTRIAL WORKERS OF THE WORLD; SOCIALISM). The socialist groups had many disagreements among themselves, but they believed that the AFL was too conservative and not aggressive enough. Gompers and the AFL leaders regarded the socialists as impractical dreamers and as a destructive element in American labor. In general, the AFL won these conflicts because of the realistic goals of its leaders and the solid benefits it helped the workers obtain. William Green succeeded Gompers as president of the AFL in 1924. In general, Green followed Gompers' policies. During the same period, John Mitchell helped organize the coal miners. In 1902, he successfully led a strike of the anthracite coal miners in Pennsylvania. Mitchell served as president of the United Mine Workers union from 1898 to 1908.

For the contributions of labor leaders during this period, see DEBS, EUGENE V.; GOMPERS, SAMUEL; GREEN, WILLIAM; HAYWOOD, WILLIAM D.; MITCHELL, JOHN.

The Congress of Industrial Organizations. In the early 1930's, at the lowest point of the great depression, the labor movement faced a bleak future. But it quickly revived after Congress passed the National Labor Relations Act in 1935.

Mass-production industries, such as the automobile industry, seemed ready for union organization in the 1930's. But a great argument raged within the labor movement itself. Many leaders of the AFL maintained that the mass-production industries should be organized on a craft basis. Another group of AFL leaders, headed by John L. Lewis of the United Mine Workers, thought that the mass-production industries should have mass-industrial unions. This group called itself the Committee for Industrial Organization. The argument concealed a struggle for power within the AFL, which expelled the industrial union group in 1937.

In 1938, the industrial union group became the Congress of Industrial Organizations (CIO). The CIO organized several million workers in the mass-production industries. In the late 1930's and 1940's, the AFL and CIO made huge gains in recruiting new members. They organized industries that had never known unions before, such as building services and laundries.

Both the AFL and CIO came out of World War II stronger than ever before. As wartime wage and price controls ended, strikes broke out in many major industries in 1945 and 1946. These strikes inspired the Labor-Management Relations Act of 1947. Congress passed this act over President Harry S. Truman's veto, and the "Taft-Hartley" controversy became a vital issue in the 1948 presidential election.

For the contributions of labor leaders during this period, see BRIDGES, HARRY; CAREY, JAMES BARRON; DUBINSKY, DAVID; HILLMAN, SIDNEY; JOHNSTON, ALVANLEY; LEWIS, JOHN L.; MURRAY, PHILIP; PETRILLO, JAMES C.

The AFL-CIO. For several years, a number of AFL and CIO leaders had dreamed of combining the two federations. This move would give them greater strength and end their disputes. Philip Murray, for years president of the CIO, died in November, 1952. Walter P. Reuther, head of the United Auto Workers, succeeded him. William Green, president of the AFL, died two weeks after Murray. George Meany, secretary-treasurer of the AFL, succeeded him. The new presidents began working in earnest to merge their federations. In December, 1955, after many months of discussion, the two groups became a single organization, the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO). Meany became its first president.

The major problem of the AFL-CIO was to deal with unethical practices in several member unions. Some union leaders had been accused of taking union funds for their own use. Others were accused of using the threat of "labor trouble" to extort money from employers and from employees. The AFL-CIO dealt with this problem by adopting ethical-practices codes. It expelled several unions that did not follow its new rules.

For contributions of labor leaders during this period, see BEIRNE, JOSEPH A.; MEANY, GEORGE; REUTHER, WALTER P.

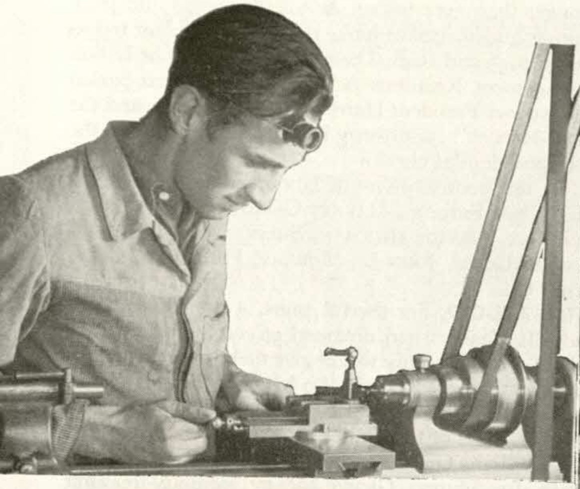
Labor in Canada

The history of labor in Canada has been similar to that in the United States. Before the 1860's, local unions sprang up and quickly disappeared. After the 1860's, railroad construction speeded the formation of national unions. The Canadian counterpart of the American Federation of Labor was the Trades and Labour Congress of Canada (TLC). It was founded in 1886, the same year that the AFL appeared, and had almost the same aims.

Canada's labor movement has reflected the disputes

LABOR IN OTHER COUNTRIES

In Underdeveloped Countries, such as China, *left,* labor often means hard work at tasks machines could do.



In Industrial Countries, such as Switzerland, workers set up strong unions.

In Agricultural Countries, such as Paraguay, the labor movement is weak.

Hassner, Gamma; Wide World; Pan American Union

between the AFL and CIO in the United States. Canadian industrial unions formed the All-Canadian Congress of Labour in 1927. It became the Canadian Congress of Labour (CCL) in 1940. It had connections with the CIO in the United States. The TLC and CCL merged to form the Canadian Labour Congress (CLC) in April, 1956. At the time of the merger, the TLC had about 600,000 members and the CCL had about 360,000 members.

Roman Catholic *syndicates,* or French-Canadian labor organizations similar to unions, form another important element in Canadian labor. In 1919, the syndicates began to organize the Confédération des Travailleurs Catholiques du Canada (CTCC), or the Confederation of Catholic Workers of Canada. In the late 1950's, the CTCC began exploring the possibility of uniting with the CLC. The CTCC has about 100,000 members.

Labor in Other Countries

International Labor Organizations bring together labor unions of all parts of the world. A congress that met in London in 1949 founded the International Confederation of Free Trade Unions. This federation includes the labor organizations of most of the countries of the non-Communist world. The AFL-CIO and Canadian federations belong to it. Labor organizations of Communist countries dominate the World Federation of Trade Unions, founded in Paris in 1945.

Europe has three distinct labor patterns. Each country may have (1) a single labor movement, (2) a number of smaller labor groupings, or (3) one or more Communist-dominated labor groups. The first pattern is represented by Great Britain, Denmark, Norway, and Sweden. The British Trades Union Congress (TUC) was founded in Manchester in 1868. With the exception of a few unions, the TUC speaks for organized labor in Great Britain. The TUC served as a model for the founders of the AFL in the United States, and labor organizations in the United States resemble it in some ways. But labor federations in Great Britain and Scandinavian countries have socialist aims and close ties with political parties. The TUC is probably the single most important influence in the British Labour party (see LABOUR PARTY).

The labor movement in West Germany resembles that of Great Britain. The *Deutscher Gewerkschaftsbund*, or Federation of German Trade Unions, includes most German labor unions. The German metalworkers' union, with 1,600,000 members, claims to be the largest single union in the world.

France, Italy, and, to some extent, The Netherlands and Belgium, have a number of labor movements that follow political and religious viewpoints. In France and Italy, the unions split along Roman Catholic, Socialist, and Communist lines. The Communist unions probably outweigh the others, but do not have exclusive control. In The Netherlands and Belgium, the unions split along Roman Catholic, Protestant, and Socialist lines. The Socialist unions probably have the greatest strength.

The third pattern is represented by Russia and the Communist countries of Eastern Europe and Asia. The Communist party completely controls unions and union federations there. Although they call themselves trade unions, these groups are not real unions, because they do not have the right to strike or to bargain.

Other Areas. Australia and New Zealand have strong, well-developed labor movements similar to that of Great Britain. But most other labor movements have little resemblance to those in North America and Europe. In general, they have developed only since 1900 and their members are inexperienced in union work. Many countries in Asia, Africa, and South America are largely agricultural. Without a large working class in industry, union organization in these areas remains weak and undeveloped.

Career Opportunities

Labor unions offer two avenues to careers. One is through activity in local union affairs while working. A worker in a factory may be elected steward or committee member, then rise as an official of the local and national union. Men who began as workers hold almost all the important policy-making positions in unions. Another avenue to a union career is in technical and professional skills. Many unions need research directors, industrial engineers, editors, and other specialists. They choose these men and women on the basis of education and previous experience. Many large companies employ skilled specialists in a wide range of personnel and labor-relations duties. They hire men and women with experience in their specialty, such as personnel work.

Almost every university has a school or department that offers specialized training in personnel administration and labor-management relations. A smaller number of universities have specialized institutes for intensive training programs in these fields. They include the University of California, the University of Chicago, Cornell University, Harvard University, the University of Illinois, the University of Iowa, the University of Minnesota, New York University, Princeton University, Rutgers University, the University of Wisconsin, and Yale University.

JACK BARBASH

Related Articles in WORLD BOOK include:

BIOGRAPHIES

An alphabetical list of biographies relating to Labor appears under the heading Labor Leaders in the BIOGRAPHY section of the READING AND STUDY GUIDE.

HISTORY

Automation
Child Labor
Domestic System
Guild
Industrial Revolution
Labour Party
Slavery
Socialism
Sweatshop

LABOR-MANAGEMENT RELATIONS

Absenteeism
Arbitration
Blacklist
Boycott
Closed Shop
Collective Bargaining
Employees' Compensation, Bureau of
Employment
Fair Employment Practices
Federal Mediation and Conciliation Service
Industrial Relations
Lockout
Minimum Wage
National Labor Relations Board
Open Shop
Pension
Profit Sharing
Strike
Unemployment
Union Label
Union Shop
Wages and Hours
Yellow-Dog Contracts

LABOR ORGANIZATIONS

American Federation of Labor and Congress of Industrial Organizations (AFL-CIO)
Industrial Workers of the World
International Conference of Free Trade Unions
International Labor Organization
Knights of Labor
Railway Brotherhoods
Trades Union Congress
Women's Trade Union League of America, National

UNCLASSIFIED

Apprentice
Capital
Employment Agency
Industry
Labor, Department of
Labor Day
Labour Party
Management
Mass Production
Migrant Labor
Pension
Peonage
Sabotage
Social Security
Trade Association
Workmen's Compensation

Outline

- **I. Labor Unions in the United States**
  - A. Kinds of Unions
  - B. Union Organization
  - C. Union Dues
  - D. Union Aims
- **II. Labor-Management Relations**
  - A. Management Aims
  - B. Collective Bargaining
  - C. Everyday Relations
  - D. Strikes and Lockouts
  - E. Human Relations
- **III. Labor and Government**
- **IV. History**
- **V. Labor in Canada**
- **VI. Labor in Other Countries**
- **VII. Career Opportunities**

Questions

What do unions work for other than higher wages?

How is the British labor movement organized?

What are the three levels of union organization?

How and when did the CIO originate?

What is labor's most important method of getting benefits for workers?

How does a worker solve problems through his union?

What are the three labor patterns in Europe?

What U.S. government agency helps settle disputes between labor and management?

How does the history of labor in Canada resemble that in the United States?

Explain the following terms: *boycott, closed shop, lockout, picket, scab, strike.*

LABOR, AMERICAN FEDERATION OF. See AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS.

LABOR, DEPARTMENT OF, is an executive department of the United States government. The Secretary of Labor, a member of the President's Cabinet, heads the department. The Department of Labor administers and enforces laws that seek to promote the welfare of wage earners of the United States, improve their working conditions, and advance their opportunities for profitable employment.

Functions. The Department of Labor administers federal laws on minimum wages, working hours, and public contracts. It develops standards and policies for promoting the welfare of women workers, improving their working conditions, increasing their efficiency, and advancing their opportunities for work. It assists former members of the nation's armed forces in exercising their reemployment rights. It serves as the chief fact-finding agency of the government in labor economics. It collects, analyzes, and publishes statistics and data on employment, housing construction, industrial relations, accidents, price trends, costs and standards of living, and wages. It promotes industrial safety and health, and develops labor standards in the areas of labor laws and administration. It administers the public employment service and the unemployment insurance programs. It carries out federal laws on workmen's compensation programs. It develops standards for apprenticeships for the training of skilled workers in industry. It handles appeals from federal workers regarding compensation. It works with other government agencies in the field of international labor relations.

The Secretary of Labor is appointed by the President with the approval of the Senate. He establishes the policies for the Department of Labor. He serves as the President's chief contact with organized labor. He is a member of the Civil and Defense Mobilization Board and the Establishment of the Smithsonian Institution.

The Under Secretary of Labor is the chief assistant of the secretary and serves as Acting Secretary of Labor in his absence. The staff of the secretary includes four assistant secretaries, an administrative assistant secretary, and a solicitor, or chief law officer.

Organization. The Department of Labor has headquarters in Washington, D.C. It consists of various bureaus, boards, and offices. An assistant secretary of labor directs the Bureau of Employment Security and the Bureau of Apprenticeship and Training. Another assistant secretary supervises the Bureau of Labor Standards, the Bureau of Employees' Compensation, the Bureau of Veterans' Reemployment Rights, and the Employees' Compensation Appeals Board. The Assistant Secretary for International Labor Affairs directs the Bureau of International Labor Affairs. The director of the Women's Bureau in the Department of Labor also serves as an assistant secretary. The Administrative Assistant Secretary coordinates department administration and management. In addition to the Women's Bureau, the department includes the Bureau of Labor Statistics, the Wage and Hour and Public Contracts Division, and field staffs and territorial representatives.

The Office of International Affairs develops programs in the field of labor in other countries. It provides American participation in the International Labor Organization.

The Wage and Hour and Public Contracts Division administers federal laws on wages, hours, and public contracts. Such laws cover minimum wages to be paid workers in interstate commerce, and the employment of children under 16 years of age in interstate commerce.

The Employees' Compensation Appeals Board reviews final decisions on appeals made by federal employees regarding compensation. It consists of three members appointed by the Secretary of Labor.

For a description of the work of the other bureaus mentioned in this section, see the separate articles in WORLD BOOK, such as EMPLOYMENT SECURITY, BUREAU OF.

History. A request to create an executive department of labor in the United States government had been made as early as 1865 by a conference of labor representatives. But Congress did not act until June 27, 1884, when it established a Bureau of Labor in the Department of the Interior. In 1888, Congress gave the bureau independent status as the Department of Labor, but its head did not serve in the President's Cabinet. The Commissioner of Labor, who headed the department, reported directly to the President. In 1903, Congress established the new Department of Commerce and Labor, and placed within it the Department of Labor with the title and status of a bureau. For a list of persons who served as Secretary of Commerce and Labor from 1903 to 1913, see COMMERCE, DEPARTMENT OF (table).

On March 4, 1913, the President signed a law creating an independent Department of Labor. Bureaus assigned to the new department included the Bureau of Labor Statistics, the Children's Bureau, and the Bureau of Immigration and Naturalization. Since then, various bureaus have been added or transferred. For example, by the end of World War I, the department had grown to include 13 separate bureaus and services. In the 1930's and 1940's, Congress passed many laws affecting the work of the department. These laws covered fair labor standards, wages and hours, public contracts, and labor and management relations. The department was the first Cabinet office to have a woman as its head, when Frances Perkins became the Secretary of Labor in 1933. The department employs about 6,000 persons.

JOHN C. BOLLENS

SECRETARIES OF LABOR

Name	Year Appointed	Under President
*William B. Wilson	1913	Wilson
James J. Davis	1921	Harding
	1923	Coolidge
	1929	Hoover
William N. Doak	1930	Hoover
*Frances Perkins	1933	F. D. Roosevelt
Lewis B. Schwellenbach	1945	Truman
Maurice J. Tobin	1948	Truman
Martin P. Durkin	1953	Eisenhower
James P. Mitchell	1953	Eisenhower
Arthur J. Goldberg	1961	Kennedy

*Has a separate biography in WORLD BOOK.

Related Articles in WORLD BOOK include:

Apprenticeship and Training, Bureau of
Employees' Compensation, Bureau of
Employment Security, Bureau of
Flag (color picture, Flags of the United States Government)
Labor Standards, Bureau of
Wages and Hours
Women's Bureau

DEPARTMENT OF LABOR

U.S. Department of Labor Building; Dept. of Labor

The Department of Labor has three main areas of interest: employment security, labor standards, and international labor affairs. It also keeps labor statistics and handles public contracts.

SECRETARY OF LABOR

UNDER SECRETARY

Assistant Secretary

Assistant Secretary

Assistant Secretary for International Labor Affairs

Bureau of Labor Standards

Bureau of Employees' Compensation

Employees' Compensation Appeals Board

Bureau of Veterans Reemployment Rights

Bureau of Apprenticeship and Training

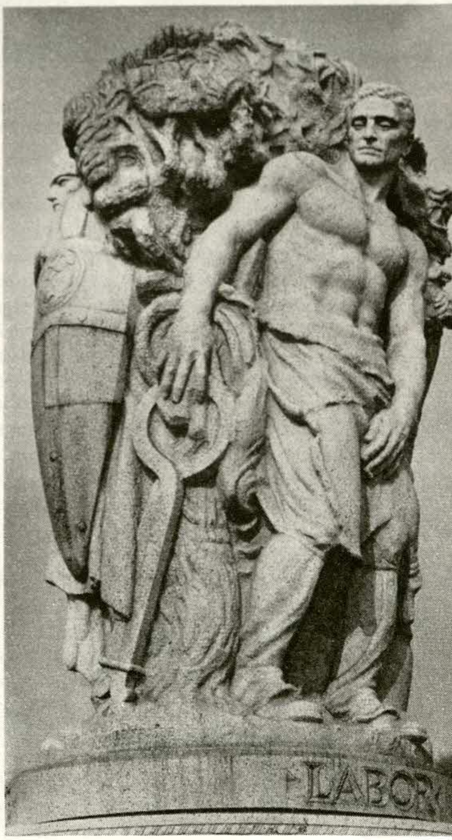
Bureau of Employment Security

Office of International Labor Affairs

Women's Bureau

Bureau of Labor Statistics

Wage and Hour and Public Contracts Division



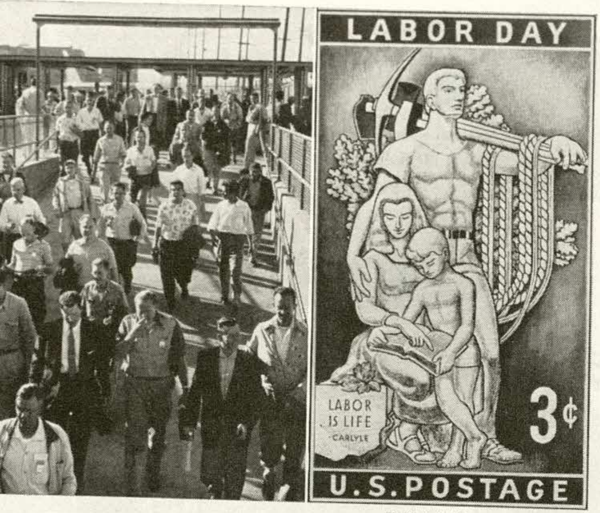
Labor Statue in West Potomac Park, Washington, D.C.; David Corson, Devaney

LABOR, DIVISION OF. See Mass Production.

LABOR, HOURS OF. See Wages and Hours; Child Labor.

LABOR, KNIGHTS OF. See Knights of Labor.

LABOR DAY is a holiday honoring working people. It is observed as a legal holiday on the first Monday in September throughout the United States, Puerto Rico, and Canada. Labor organizations sponsor various celebrations, but for most persons it is a day of rest and recreation. It also has become a symbol of the end of summer. In Australia, Labor Day is called *Eight Hour Day*, and commemorates the successful struggle for a shorter working day. The date of the Australian holiday varies from state to state. European countries observe Labor Day on May 1.



Ewing Galloway; Wide World

Labor Day honors the millions of workers employed by U.S. industries. A 1956 postage stamp, *right*, commemorated the holiday.

In 1882, Peter J. McGuire, founder of the United Brotherhood of Carpenters, suggested a national holiday to honor the country's working people. In September of the same year, workers staged the first Labor Day parade in New York City. Organized labor then campaigned to make the day a national holiday. Oregon became the first state to make Labor Day a legal holiday, in 1887. President Grover Cleveland signed a bill making Labor Day a national holiday in the United States in 1894.

Elizabeth Hough Sechrist

LABOR LEGISLATION. See Labor (The Federal Government); Child Labor; Strike; Workmen's Compensation.

LABOR-MANAGEMENT RELATIONS involve dealings between groups of employers and employees. In contrast, *personnel management* concerns employment relationships between employers and individual employees (see Personnel Relations). The term *labor-management relations* usually describes joint determination by employers and unions of wages, hours, and working conditions.

Employment not only helps people attain certain goals, but also aids in providing goods and services. Wages and salaries make it possible for employees to buy the necessities of life, and to enjoy luxuries. They also seek dignity, prestige, status, job security, and opportunity for advancement. The importance attached to working conditions arises from social and psychological causes, as well as from actual physical conditions of employment. If a person regards his pay and working conditions as inadequate or unfair, he becomes dissatisfied and may resort to some action to change existing conditions. Some actions, such as strikes, last only a short time. Other actions may result in institutions to deal with the problems. Labor unions represent one such institution. They are designed to give employees a voice in determining their wages, hours, and working conditions, and to equalize bargaining strength between employees and employers.

Agreements between labor and management determine employment relations. *Collective bargaining* provides the basic framework for labor-management relations. It involves recognition of a union or employer association, and then negotiation of a contract. A contract generally provides for wages and working conditions, and a means of settling differences in contract interpretation. Laws provide some rules for collective bargaining, and set certain minimums for wages, hours, and working conditions. The parties involved usually decide their own specific employment conditions and relations within this framework of rules. See Labor (Collective Bargaining).

Labor-management cooperation may extend beyond collective bargaining. It may involve joint programs to increase productivity and profits, and to reduce waste and labor costs.

History. Employers once determined employment conditions largely by themselves. Dissatisfied employees had no way of correcting abuses or of improving their conditions other than by individual negotiation. The courts regarded the first attempts at collective employee action as illegal. Early labor-management relations often resulted in violence. Both sides used strikes, lockouts, boycotts, and other forms of force.

The modern era of labor-management relations began in the 1930's. The National Labor Relations Act (Wagner Act) of 1935 and other laws permitted employees to form unions of their choosing. Laws required employers to bargain with these unions. Employers, unions, and government groups appointed labor-management specialists. Orderly negotiations for settling disputes greatly reduced violence.

H. G. Heneman, Jr.

See also Labor.

LABOR PARTY. See Labour Party.

LABOR STANDARDS, BUREAU OF, is a service agency that was established in the U.S. Department of Labor in 1934. It assists state labor departments, employers, and civic groups in improving working conditions. The agency also cooperates with the Bureau of International Labor Affairs in establishing international labor standards.

The agency supplies technical information to persons working to improve labor laws. It serves as an advisory center on problems of child labor and youth employment. The work of the bureau promotes the safety and health of industrial workers. Safety codes, inspector training, and special accident-prevention programs are also part of this service.

John C. Bollens

LABOR STATISTICS, BUREAU OF (BLS), is the research and fact-finding branch of the U.S. Department of Labor. It was established in 1913 to assemble information on all phases of labor and on the ways to improve the position of wage earners.

The BLS collects information on the number of employed workers and on trends in employment. It conducts studies on the problems of particular working groups. It collects data on the earnings, hours, housing, and costs of living of workers. Industrial disputes and work injuries are studied for use in improving labor-management relations. The bureau collects data on employment possibilities for use in occupational guidance by counselors and teachers. This information is published in the *Monthly Labor Review*. John C. Bollens

LABOR UNION. See Labor.

LABORATORY is a place equipped with scientific apparatus, where scientists perform experiments and test theories. Laboratories are found in grade schools, high schools, and colleges; in research institutions; and in many industrial organizations. Testing laboratories, such as the Underwriters' Laboratories, Inc., test a variety of products. They often put their seal of acceptance on approved products, and also suggest minimum standards for manufacturers. See also Chemistry; Physics; Science.

LABORATORY SCHOOL is a school used for the observation and study of children, and for evaluating teaching methods. It is sometimes called a *campus school*, because it is usually located on the campus of a college or a university. It may be an elementary school, a high school, or a combination of the two.

The laboratory school carries on all the functions of a regular public school. It also provides opportunity for one or more of the following activities.

1. College students in education can observe children and teaching methods.
2. Students can practice teaching under the supervision of experienced teachers.
3. College staff members and their students can conduct research and experimentation in teaching methods.

Colleges try to use in their laboratory schools the best teaching methods known. Roy C. Bryan

LABORATORY TECHNICIAN. See Medicine (Careers in Medicine).

LABORSAVING DEVICES. See Appliances; Automation; Factory; Farm Machinery; Homemaking; Industrial Revolution; Invention; Mass Production.

LABOUR PARTY is one of the two main political parties in Great Britain. It advocates socialistic policies, and has brought about many changes in the British economic system. The Labour party contains several independent organizations grouped together for political purposes. They include trade unions, socialist and cooperative societies, and local Labour parties. Yearly conferences formulate policy and elect an executive committee. Labour members of Parliament make up the Parliamentary Labour party, which elects the party leader. If the party wins a majority in Parliament, this leader becomes Prime Minister.

Early History. The working classes in Great Britain got the right to vote under the terms of the Reform Bill of 1867. But, unlike the socialist workers on the European continent, the British workers did not at first favor independent political action. Not until later in the 1800's did the Labour party begin to take shape. This occurred under the leadership of several groups, particularly the Fabian Society and the Independent Labour party. These groups faced a difficult task. Many labor leaders preferred to cooperate with the Liberal party, and many union members did not believe in socialism. After years of discussion, the first really effective steps were taken in 1900, with the formation of a Labour Representation Committee. It included representatives of trade unions and socialist groups. The Labour party elected 29 candidates in 1906, but its growth was uneven. During World War I, some of its leaders alarmed the country by their pacifism.

After the war, the party openly declared itself in favor of socialism. Its membership grew, and, in 1924, Ramsay MacDonald formed the first Labour government. However, Labour still depended on Liberal votes for its majority in the House of Commons, and thus had little chance to follow an independent policy. A similar situation prevailed in 1929, when a second MacDonald government was formed. The party received a severe shock in 1931, when MacDonald and several other Labourites joined the Conservative and Liberal parties in a National Government designed to combat the depression. Many Labour members felt that MacDonald had become a traitor to their cause. But the party recovered quickly from the setback, and offered formidable opposition to the Conservatives throughout the 1930's.

Later Development. During World War II, Labour joined with Winston Churchill's government to carry the nation to victory. After the defeat of Germany in the spring of 1945, this political cooperation ended, and a general election was held. Labour won by a large margin, and Clement Attlee became Prime Minister.

The Labour government used the period from 1945 to 1951 to carry out much of its program. It passed laws *nationalizing*, or placing under government control, certain services and industries. These included the Bank of England, coal mining, certain forms of transportation, electricity and gas services, civil aviation, and the iron and steel industry. Former owners received compensation, usually in the form of government securities. In all, nationalization applied to about one fifth of the industrial capacity of the country.

The Labour government also made important changes in social services. New and revised programs extended insurance and pension coverage. The National Health Service Act provided for free medical and dental services for the entire population.

The Conservatives returned to power in 1951, and retained it in the 1955 elections. They denationalized the iron and steel industry, as well as long-distance hauling, but kept most other Labour innovations. In 1955, Hugh Gaitskell succeeded Attlee as the party's leader. James L. Godfrey

Related Articles in World Book include:

Attlee, Clement R.
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Fabian Society
Gaitskell, Hugh T. N.
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MacDonald, James Ramsay
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LABRADOR

Airborne Ballot Boxes. A helicopter carrying ballot boxes for a federal election adds a modern touch at the tiny village of L'Anse au Loup in southern Labrador.

National Film Board of Canada

LABRADOR is a large peninsula in northeastern Canada. Most of it belongs to Quebec. Labrador's so-called eastern "Coast" forms part of the province of Newfoundland. Since 1927, the term "Coast" has meant the coast as well as an inland area extending as much as 450 miles west from the Atlantic Ocean. This article discusses the Newfoundland part of Labrador, which covers 112,630 square miles.

Labrador extends farther east than any other part of the North American mainland. The Strait of Belle Isle in the southeast separates Labrador from the island of Newfoundland. Quebec forms Newfoundland's southern and western boundaries in Labrador.

The abundance of fur-bearing animals and the rich coastal fisheries brought French settlers to Labrador in the early 1700's. These two industries still provide a living for many of the people. Rich iron-ore deposits in the west support a mining industry that began to develop in the 1950's.

Labrador is a land with long, severe winters. In the interior, snow covers the ground from September to June. The average July temperature ranges between 45°F. and 60°F. The climate makes agriculture impossible in Labrador, except for some vegetable growing. The people depend on supplies brought from other parts of Canada for nearly all their food except fish and game meat. As part of Newfoundland, Labrador sends two representatives to the legislature at St. John's, the provincial capital.

The Land and Its Resources

Labrador lies on a rough plateau of ancient rock formations. Valleys and rapid rivers draining into the Atlantic have deeply cut the coastal edge of the barren plateau. The 600-mile-long Hamilton River is the largest river of Labrador. Grand Falls on the Hamilton represents the chief source of hydroelectric energy. Lakes cover much of southwestern Labrador. The *color map* with the NEWFOUNDLAND article shows that Labrador's highest peaks rise in the north and southwest. Cirque Mountain (5,500 feet) is the highest point in Newfoundland.

Labrador may be divided into two distinct parts, each with a different economy. The economy of *Coastal Labrador* depends on rich fisheries and fur trapping. White settlers came to this area in the 1700's. *Western Labrador* has great iron-ore wealth, discovered in 1895. The resources of this area remained unexplored and undeveloped for many years, because of the severe climate and rugged terrain, and the lack of settlers willing to live in the region.

Labrador has about 65,000 square miles of valuable timber, chiefly near the Hamilton River. The main forest trees are spruce, balsam fir, and birch. Wild animals in the forests include caribou, bears, beavers, ermines, foxes, lynxes, martens, minks, otters, squirrels, and wolves. Atlantic salmon, cod, herring, seals, and trout are caught in the coastal waters. Ducks and geese and other migratory water birds visit Labrador each year.

Climate. Weather reports come mainly from the coastal area, because few people live in the interior. Temperatures in Labrador fall below freezing almost every month of the year. Temperatures on the coast sometimes fall as low as −40°F. in winter, and occasionally rise to more than 80°F. during the summer months. The interior and the northern coast have especially severe winters. In summer, drifting ice from the Arctic may chill the coast while the interior remains warm. Labrador has an annual average precipitation (including melted snow) of 30 inches. The average annual snowfall (unmelted) measures 150 inches. The coast has frequent storms, especially between November and January, when gales often blow.

The People and Their Work

Labrador had a population of 10,814 in 1956. Most of the permanent white settlers live in small fishing communities, or in towns such as Goose Bay, which grew up in connection with defense bases. Fishing and construction work on these bases provide the two chief sources of income for the people of Labrador. Eskimos and Indians make up more than a tenth of the population.

Labrador has valuable Atlantic salmon, herring, trout, and seal fisheries. Cod, the most plentiful fish, provides the greatest income. The fishing season begins in June and usually ends in September. Fur trapping was an important occupation in Labrador for many years, but it declined greatly in the mid-1900's, with less demand for long-haired furs. Mink, beaver, red fox, ermine, lynx, and otter furs lead in value. The rocky soil and short, cold summers limit farming to vegetable growing. The people around Goose Bay and along the Strait of Belle Isle raise good crops of potatoes, cabbage, beets, turnips, and broccoli.

The Labrador Trough, a narrow belt of land rich in iron ore, stretches along the western edge of Labrador. The Trough is not more than 45 miles wide at any point, but it extends 1,700 miles in a vast horseshoe through central Quebec, Labrador, and the Hudson Bay region. The Labrador part of the Trough alone has iron ore deposits estimated at a billion tons.

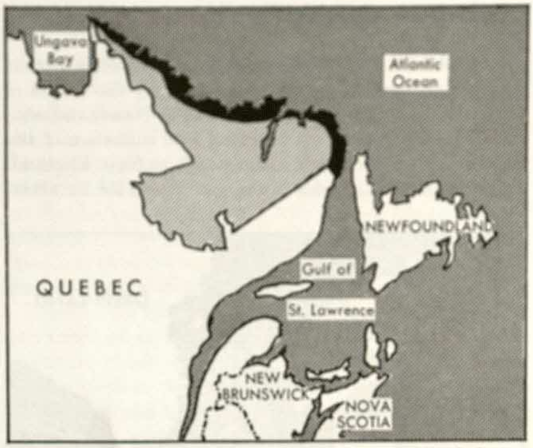
During the 1940's, exploration of the Knob Lake area on the Labrador-Quebec frontier uncovered about 400,000,000 tons of high-grade iron ore. In 1954, a mining company completed the 357-mile Quebec, North Shore, and Labrador Railway to bring this ore to markets. The railway runs between Knob Lake and Seven Islands, a Quebec port on the Gulf of St. Lawrence. Ships then carry most of the ore to steel mills in the United States. In 1956, a rough road was built to connect the railway with Grand Falls on the Hamilton River, 115 miles east. Labrador has two short highways. One links several villages in the Strait of Belle Isle. The other runs about 30 miles between Happy Valley near Goose Bay and the village of North West River.

During the months that the coast is ice-free, from June to November, the Canadian government maintains a steamer and motorboat coastal service that brings mail and supplies to the people. The communities must get their food and most other supplies in autumn to last until June. In northern Labrador, the people—mainly Indians and Eskimos—can buy supplies at trading posts operated by the provincial government.

The largest coastal villages are Battle Harbour, Cartwright, Happy Valley, Hebron, Hopedale, Nain, North West River, and Rigolet. Happy Valley is Labrador's largest town. Nearby Goose Bay grew up around an important air base. Knob Lake, known as Schefferville in Quebec, is the largest mining town in western Labrador. A number of maintenance and prospecting camps lie in the interior, especially along the railroad.

History

Some geographers believe that the viking explorer Leif Ericson discovered the coast of Labrador about A.D. 1000. The origin of the name *Labrador* is uncertain. Most historians claim that the region was named for Juan Fernandez, a Portuguese explorer and an associate of John Cabot. Cabot probably sailed along the Labrador coast in 1498. Fernandez was called a *llavrador*, or *lavrador*, which means *farmer*, because he owned land in the Azores. The name Labrador was first applied to Greenland, when Greenland was believed to be part of the North American mainland. Many other explorers visited the coast of Labrador after Cabot's voyage to the area. But they brought back unfavorable reports about the land and the climate.



The Labrador Part of Newfoundland became much larger in 1927 when the shaded area was added to the narrow coastal land. The rest of Labrador belongs to Quebec.

Until the 1700's, only Eskimos and the Naskapi and Montagnais Indians of Algonkian origin lived in Labrador. The earliest white settlers were French fur traders and seal hunters. They established trading posts along the coast before Britain seized Labrador from France in 1759, during the French and Indian War. English-speaking fishermen also built permanent homes there, mostly in the 1800's. Explorers of the Hudson's Bay Company ventured into the interior in the 1840's.

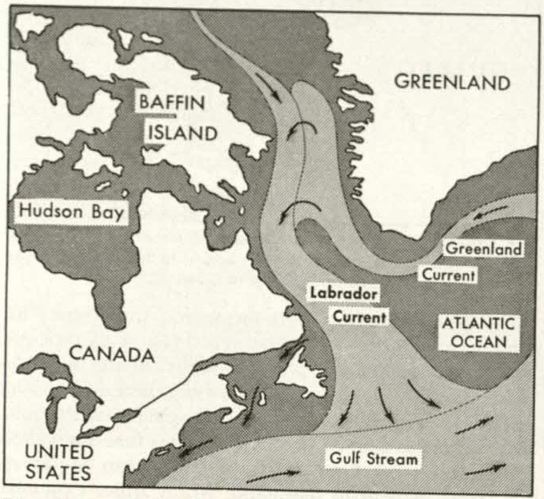
The white settlers, Eskimos, and Indians were leading lives of extreme hardship when Wilfred T. Grenfell, an English medical missionary, first visited them in 1892. Grenfell made the suffering of these people known to the rest of the world, and obtained money for hospitals, schools, and church missions.

Newfoundland and Quebec disputed the ownership and boundaries of the Labrador interior as interest grew in the area's resources. In 1927, the British Privy Council finally settled this question by defining the present boundaries in favor of Newfoundland. It interpreted the term "coast" as "watershed." Thus, the Newfoundland part of Labrador includes the area drained by rivers flowing into the Atlantic Ocean along the east coast.

During World War II, the U.S. Army arranged with Great Britain to station American troops in Labrador to keep Nazi submarine raiders from using the coastal waters as a base. Newfoundland became a province of Canada in 1949. Since that time, industrial companies have started to develop the rich natural resources of Labrador. FRED W. ROWE. Critically reviewed by GORDON O. ROTHNEY

See also CANADIAN SHIELD; GRENFELL, SIR WILFRED T.; HAMILTON RIVER; LABRADOR CURRENT; NEWFOUNDLAND.

LABRADOR CURRENT is a cold ocean current that rises in the Arctic Ocean. It flows along the shores of Labrador to a point near the island of Newfoundland, where it meets the Gulf Stream. The influence of the Labrador Current is felt as far south as New England. The harbors of Labrador are blocked with ice for about half the year, partly because of this cold current. But the ports of the British Isles, which have the same latitude as Labrador, remain open to shipping throughout the year. These ports are ice-free partly because of the warm Gulf Stream.



The Course of the Labrador Current follows the eastern coast of Canada southward, as shown by the arrows. This cold current meets the warm Gulf Stream, which flows in a northeasterly direction. When the two currents meet, thick fog results.

When cold air above the Labrador Current meets the warm, moist winds above the Gulf Stream, heavy fogs form off the coast. Ships must navigate carefully through these fogs. Henry Stommel

See also Fog; Ocean Currents.

LABRADOR DUCK. See Bird (Extinct Birds).

LABRADOR RETRIEVER is the most popular breed of dog trained to bring back game that has been shot. The dog originally came from Newfoundland, not Labrador. It was developed in England. The Labrador has two outstanding characteristics, its coat and its tail. The coat is thick and water-resistant. It is usually black, but may be golden yellow. The dog's tail is short and unusually thick at the base. The Labrador is a fast worker on land and in the water. William F. Brown

See also Dog (color picture, Sporting Dogs).

LABRADOR TEA is the name of six kinds of small evergreen plants in the heath family. They grow in the swamps of Greenland, Northern Europe, and in northern and subarctic North America. The leaves have a mild narcotic substance and have been used for tea and as a substitute for hops in making beer. Tannin, used in tanning animal hides, also comes from the leaves.

Scientific Classification. Labrador tea plants are members of the heath family, *Ericaceae*. These plants make up the genus *Ledum*. Harold Norman Moldenke

See also Heath.

LABRADORITE. See Feldspar.

LA BREA, *luh BRAY uh,* **PITS** are one of the world's richest known sources of Ice Age fossils. They lie in Hancock Park in Los Angeles. Beginning in 1906, when the remains of a giant prehistoric bear were found, about a million well-preserved skeletons of sabre-toothed tigers, giant wolves, llamas, camels, horses, giant ground sloths, and other ancient animals have been dug from the various layers of oil and tar. These animals became trapped when they came to drink from the shallow pool that covered the sticky asphalt bog. Some of the Indians in this area used the pitch to cover their baskets and canoes. Early Spanish settlers waterproofed their adobe houses with it. Exposition Park in Los Angeles displays a number of plants and animals which were taken from the La Brea pits. George Shaftel

LA BRUYÈRE, *la bryoo YAIR,* **JEAN DE** (1645-1696), a French satirical writer, published a translation of *Characters* (1688), written by the Greek philosopher Theophrastus. In imitation, La Bruyère set down impressions of people of his own time. Some of his word portraits are unkind. Such chapters as *On Court Life, On Nobles,* and *On Some Customs* reveal deep pessimism. But elsewhere he shows more tolerance towards his fellowmen. La Bruyère was born in Paris, and spent most of his life in or near the city. F. J. Crowley

LABURNUM, *luh BUR num,* is a small tree with bright yellow blossoms. Its glossy leaves remain green until late in the autumn. The seeds grow in pods. The *common laburnum,* native to Asia, is sometimes called *golden chain* because of its long clusters of yellow flowers. It is also called *bean tree* and *bean trefoil.* This kind of laburnum is somewhat sensitive to cold. The *Scotch laburnum* is native to southern Europe. It is hardier than the common laburnum, and has longer flower clusters. Laburnums have hard, fine-grained wood. The seeds, roots, and other parts of the laburnum contain a poisonous substance called *cytisine.*

Scientific Classification. Laburnums belong to the pea family, *Leguminosae.* The common laburnum is genus *Laburnum,* species *anagyroides.* T. Ewald Maki

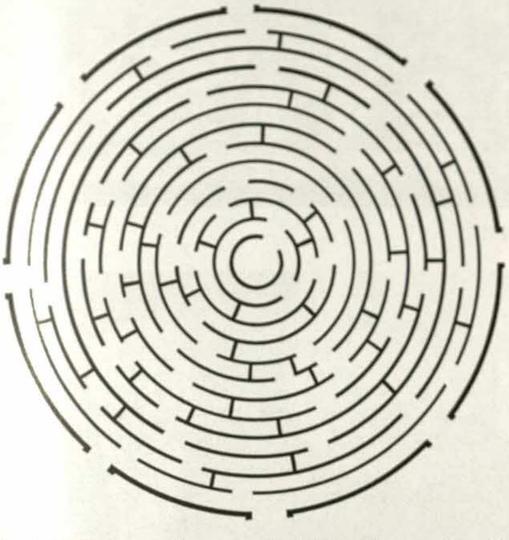
LABYRINTH, in anatomy. See Ear (The Inner Ear).

LABYRINTH was a building with many confusing paths and passageways. According to legend, Daedalus built it for King Minos of Crete. Minos wanted it as a prison for the monster called the Minotaur. He sacrificed seven Greek youths and seven maidens to the Minotaur every year.

Theseus, the son of a Greek king, went into the labyrinth, killed the Minotaur, and found his way out of the twisting passages. Ariadne, Minos' daughter, had given him a ball of thread to unwind as he went in. He followed the thread and escaped.

Archaeologists have discovered a palace which may have been the Cretan labyrinth. It is full of winding passages, and stands on a mountainside near Knossos in Crete. Traces of another great labyrinth were found in Egypt. Herodotus says that the Egyptian labyrinth was more marvelous than the Pyramids. It was probably built in imitation of the older Cretan labyrinth.

Buildings with confusing and seemingly endless networks of passages are found in many amusement parks. A modern labyrinth of this nature is sometimes called a *maze,* and is used for testing skill in escape. Many toys and games are based on the pattern of the laby-



The Labyrinth, or Maze, was first designed as a prison. The ancient Egyptians built a labyrinth similar to the one shown here.

rinth. Psychologists use mazes in experiments to test the reactions of animals. PADRAIC COLUM

See also ARIADNE; DAEDALUS; MINOTAUR; THESEUS.

LAC is a sticky substance given off by scale insects. They gather by the hundreds of thousands on the twigs and branches of the soapberry and acacia trees of India and Burma. The sticky substance, or secretion, from these insects is called *lac*. It comes from the Persian word *lak* and the Hindu word *lakh*, both of which mean *hundred thousand*. The shellac that protects furniture and floors is made from lac (see SHELLAC).

Lac insects are tiny and scaly, with wings that fold back along their bodies. They pierce the bark of trees with their long beaks and feed on the sap. As they do so, they discharge a quantity of lac to protect themselves from their enemies. The female insect lays several hundred eggs before she dies. The young insects hatch out as worms, or *larvae*. When the larvae grow into insects, they leave the old tree to seek new, fresh twigs to feed on. This period in their life cycle is called *swarming*.

Lac is usually harvested by cutting almost all the twigs before the larvae mature. Workers leave some larvae to provide future generations of insects. When the larvae are ready to swarm, the twigs are fastened onto trees where the workers want the insects to feed.

The crude substance gathered from the twigs is called *stick lac*. Workers grind it between stones and wash it in water to remove the coloring matter. In this stage, the substance is called *seed lac*. Workers melt seed lac in long, narrow cloth bags and squeeze it through the cloth to filter out impurities. Then they take the warm lac between their teeth, toes, and fingers and stretch it into thin sheets. When these sheets cool, they are broken into flakes. The orange-colored shellac we buy is made from these flakes by dissolving them in alcohol. Lac may also be bleached and sold as white shellac. It is often formed into cakes called *button lac*.

Shellac can be molded into electric insulators and other articles. It is also used in abrasives, sealing wax, and some phonograph records. C. L. MANTELL

LAC LÉMAN. See LAKE GENEVA.

LACCADIVE, *LAK uh dive,* **ISLANDS** are a group of 14 coral islands off the southwest coast of India in the Arabian Sea. They occupy 760 square miles, in the Laccadive, Amindive, and Minicoy Islands Territory of India. Most of the 21,000 people of the Territory live on the Laccadive Islands. Only nine of the islands are inhabited. The island group lies so low in the ocean that only their coconut groves make it possible for a person on board a ship to see the islands.

Most of the islanders speak the Malayalam language, but they belong to various Arabian tribes. The women make an elastic fiber called *coir* from coconut husks. Coir is used in the manufacture of matting. The men build boats and trade on the mainland. They exchange their copra and coconut fiber chiefly for rice, their principal food. ROBERT I. CRANE

LACCOLITH. See VOLCANO (How Volcanoes Are Formed).

LACE is an open fabric made with threads of linen, cotton, silk, silver, or gold. It may also be made from nylon and, to a limited extent, from wool. Handmade lace is usually made from linen thread, because of its softness. Most lace consists of two elements: the pattern, called the *toilé*, and the ground that holds the pattern together, called the *réseau*. The word *lace* comes from the Latin word *laqueus*, meaning a *noose* or *snare*.

The two main types of lace are *bobbin* and *needlepoint*. Other types of lace are *crocheting*, made with a needle, and *tatting*, made by knotting threads (see CROCHET; TATTING).

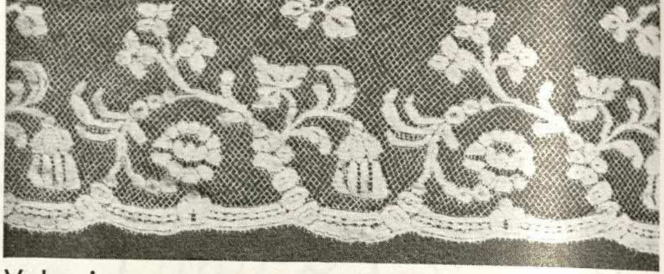
Bobbin Lace is associated with the Flemish people of Belgium and The Netherlands. But it is also made in Italy, France, and England. Bobbin lace is sometimes called *pillow lace*, because the design is drawn on

Fine Bobbin Lace, long associated with the Flemish people, is still made by hand in Bruges, a city in West Flanders.

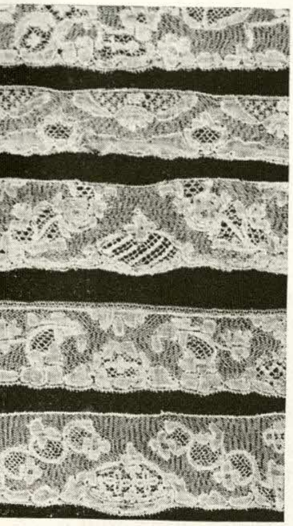
Russell Wright

TYPES OF BOBBIN LACE

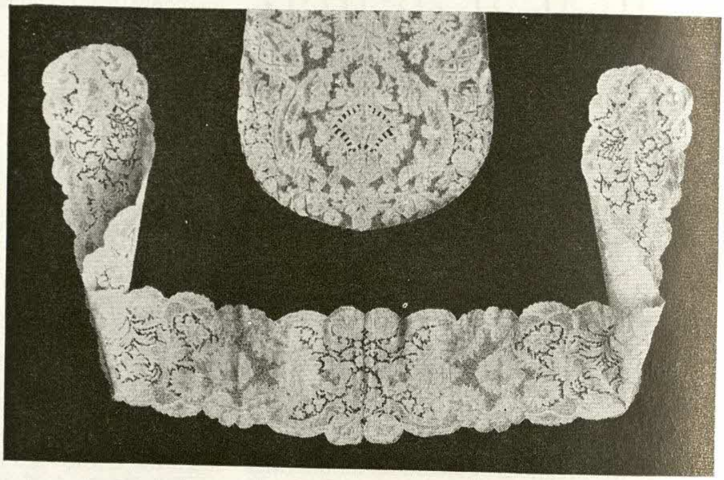
The bobbin method of making lace sometimes is called the pillow process. This is because the design is worked over a parchment pattern placed on a pillow held in the worker's lap.



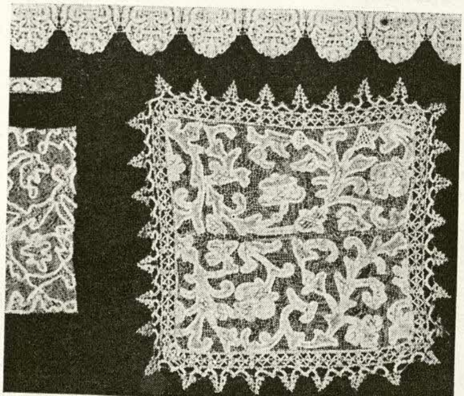
Valenciennes



Mechlin



Point d'Angleterre



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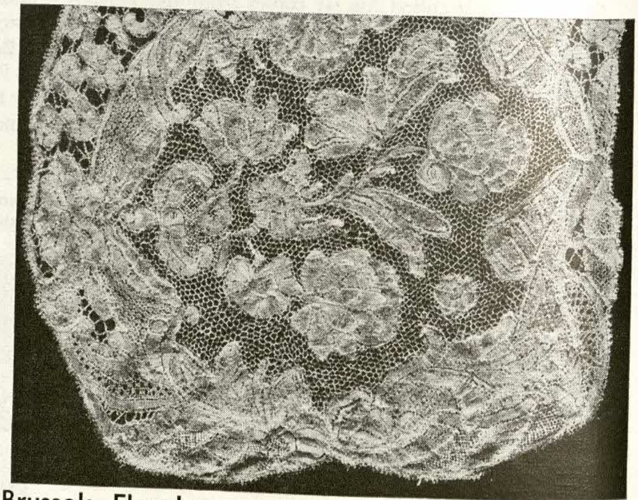
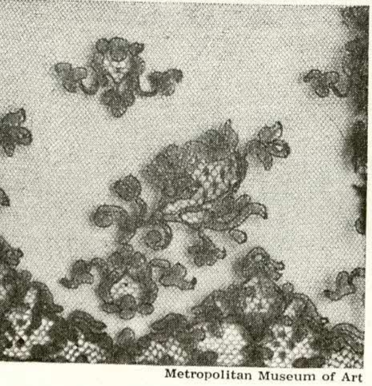


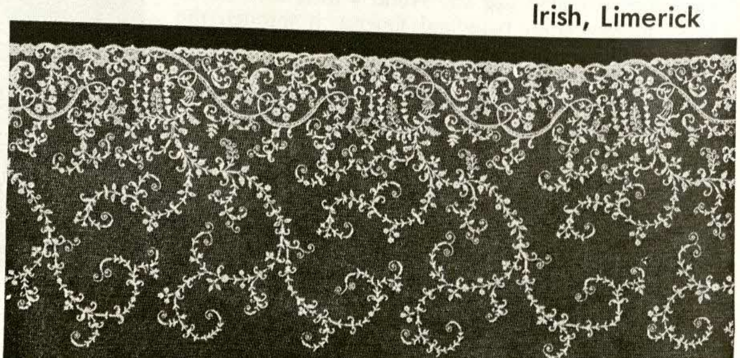
Brussels, Flanders

Chantilly



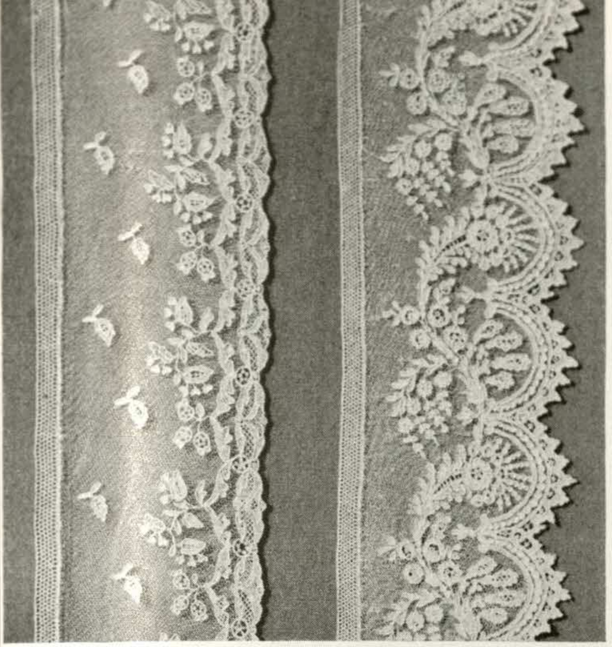
Metropolitan Museum of Art

Irish, Limerick

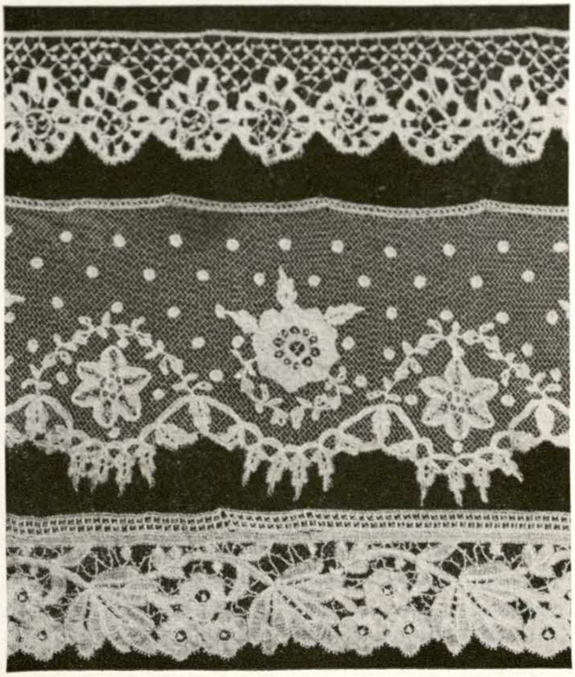


TYPES OF NEEDLE-POINT LACE

Delicate but enduring, needle point is made with a needle and a single thread. The lacemaker completes each mesh of the design before starting a new one. In old pieces, linen sometimes served as a foundation.

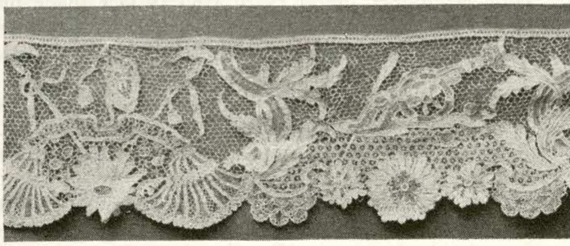


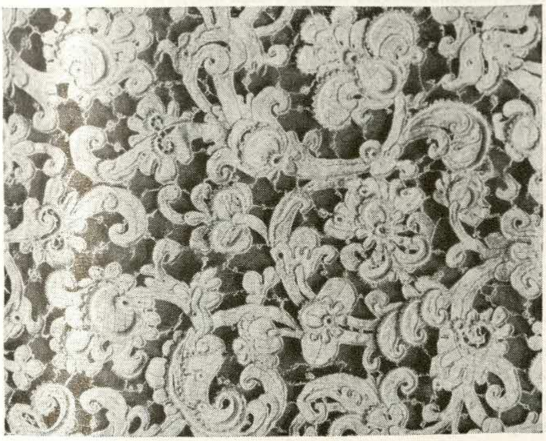
Alençon



Brussels

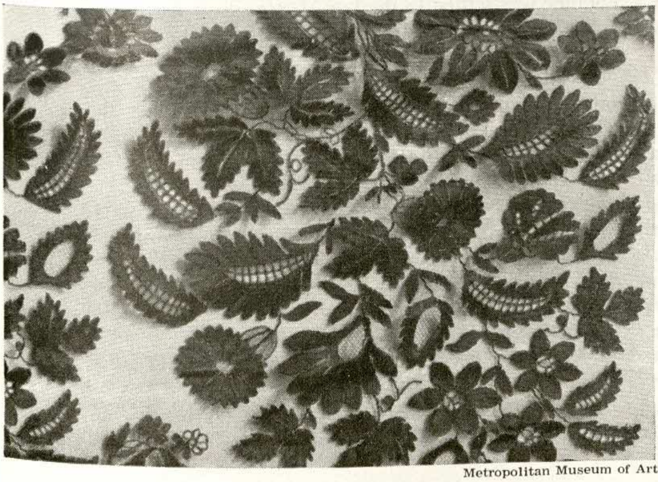
Argentan





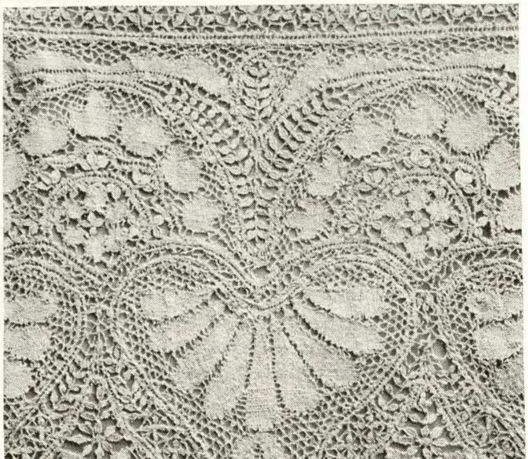
Venetian, Gros

Spanish



Metropolitan Museum of Art

Maltese



a pillow or on parchment fastened to a pillow. The lacemaker sticks small pegs into the pillow along the lines of the design, and works many small bobbins of thread around the pegs to produce the lace. As the lace is completed, the lacemaker pulls the pins out and removes the lace from the pillow. Some of the best-known bobbin laces include Mechlin, Binche, Maltese, Valenciennes, Lille, Chantilly, Honiton, and Cluny.

Needle-Point Lace. The ground for needle-point lace may be either net or connecting threads called *brides.* In making this type of lace, the lacemaker first draws the design on parchment and stitches it to a backing of stout linen. Lace is then made by filling in the pattern with buttonhole stitches. The pattern may be made separately and the ground added later. Or the lacemaker may create the two together by carrying several threads along to make stitches for the pattern and ground at the same time. Needle-point lace is called *point* in France and *punto* in Italy. Both words mean *stitch.* This type of lace should not be confused with a kind of embroidery that is also called needle point (see NEEDLE POINT). Examples of needle-point lace include Venetian, Alençon, Argentan, and Brussels.

Development. The first lacelike decorations, called *passementerie,* consisted of narrow braids or edgings known as *passements.* Lace as we know it developed in Italy in the 1400's. It grew out of the cut work, or open pattern, in embroidery. The beautiful lace of the Renaissance and later periods was glorified in art by such painters as Raphael, Frans Hals, and Velázquez. It was a mark of prosperity. Catherine de Médicis introduced lace into France in 1533. Lafayette first brought it to America.

Most lace is now made by machine. Machines can copy accurately almost every kind of lace made by hand. The lace machine was developed in England. By 1780, net machines were used in France. In 1809, John Heathcoat of England patented a "bobbin net" machine, which John Leavers improved in 1813. This machine became the basis for lace machines used today. Rhode Island produces about 70 per cent of all Leavers lace made in the United States.

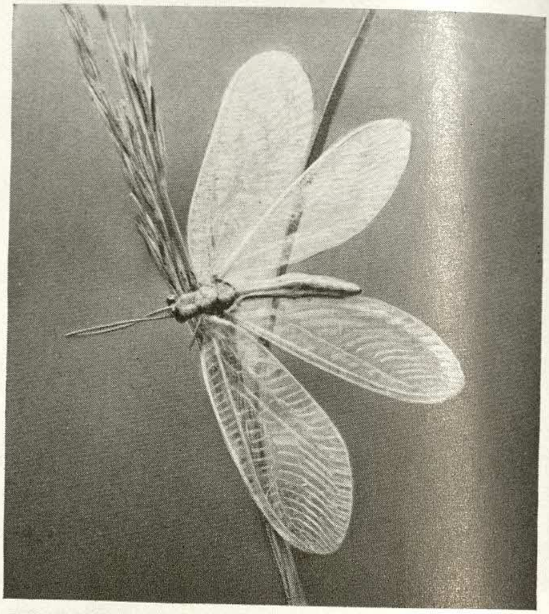
Comparison of machine-made and handmade laces indicates that the latter can be raveled, and have more irregularities in pattern. The threads are interwoven so that they will not slide back and forth. Machine-made lace has a flat, dull appearance. HELEN MARLEY CALAWAY

See also SPAIN (picture, World-Famous Lace).

LACE GLASS. See GLASSWARE (Early Glassware).

LACEDAEMON. See SPARTA.

LA CEIBA, *lah SEH ee vah* (pop. 16,645), one of the principal Caribbean ports of Honduras, lies 115 miles north of Tegucigalpa. For location, see HONDURAS (color map). It is a distribution center for the products of north and northeast Honduras. Industries in La Ceiba produce footwear, cigars, soap, and coconut oil. Major exports include abacá fiber, coconuts, and oranges.



Cornelia Clarke

The Lacewing Deserves Its Name. The four graceful wings are so thin and delicate that they look like spun glass.

LACEWING is a frail insect with two pairs of pretty lacy wings for which it is named. Lacewings lay their eggs on the tips of small threadlike stems attached to a leaf. Only one egg is laid on a stem. This prevents the hungry newly hatched larva from eating its neighbors. The larvae are yellow or grayish. They have large sickle-shaped jaws to capture and suck the juices of aphids, scales, mites, leafhoppers, and thrips. They are sometimes called *aphis lions.* The full-grown larva spins a silk cocoon. After two weeks, an adult lacewing emerges.

Scientific Classification. Lacewings belong to the order *Neuroptera.* They make up the families *Chrysopidae* and *Hemerobiidae.* E. GORTON LINSLEY

See also APHID; LARVA (picture); NEUROPTERA.

LACHAISE, GASTON. See SCULPTURE (Sculpture of Today).

LACHESIS. See FATES.

LACHINE, *luh SHEEN,* Que. (pop. 34,494), is an industrial center and shipping port on the island of Montreal. The island stands at the eastern end of Lake St. Louis at the head of the Lachine Rapids. For location, see QUEBEC (color map). The Lachine Canal bypasses the rapids and connects the lake with the St. Lawrence River at Montreal, eight miles east of Lachine. Factories in Lachine make cement, electrical apparatus, iron and steel products, rubber, and wire. Lachine was settled in the late 1600's. M. G. BALLANTYNE

LACHRYMAL, or **LACRIMAL, BONE.** See FACE.

LACHRYMAL, or **LACRIMAL, GLAND.** See TEARS.

LACKAWANNA, *LACK uh WAHN uh,* **RIVER** is a small stream in Pennsylvania. Its valley holds the largest anthracite coal fields in the United States. The Lackawanna rises in the northeastern part of the state near Union Dale and flows southwest for about 50 miles through a narrow pass between the Shawnee and Moosic mountains. The river empties into the Susquehanna River at Pittston. A decline of mining has led to diversified industry, with Scranton the key city in the valley. S. K. STEVENS

LACKLAND. See JOHN of England.

LACLÈDE, PIERRE (PIERRE LACLÈDE LIGUEST). See SAINT LOUIS, Mo.

LACLÈDE'S VILLAGE. See SAINT LOUIS, Mo.

LACOMBE, ALBERT. See ALBERTA (The Missionaries).

LACONIA, *luh KOH nih uh,* was the home of the Spartans in ancient times. It formed the extreme southern part of the Peloponnesus, or southern Greece. Laconia was bounded on the west by Messenia and on the north by Arcadia and Argolis. The south and east shores were washed by the Mediterranean Sea.

Laconia made an ideal home for the Spartan warriors. The rocky east coast and the capes that enclosed the south coast made it difficult for enemies to attack the country from the sea. The central part of Laconia lay deep in a sheltered, fertile valley formed by the Eurotas River. High mountains hemmed in the valley.

In the poems of Homer, Laconia is the kingdom of Menelaus, husband of Helen of Troy. Modern Laconia is a part of Greece. CHARLES BRADFORD WELLES

See also SPARTA.

LACQUER, *LACK er,* is a shiny, protective film used on metals, woods, and porcelain. Lacquer is made from compounds of cellulose, resin, or lac.

Lacquer made with resin is called a true "spirit" varnish. The resin is usually mixed with turpentine. The turpentine evaporates when it is exposed to air, leaving only the coating of resin on the material. When a cellulose compound is used to make lacquer, the compound is usually dissolved in butyl alcohol or butyl acetate. The butyl compounds also evaporate when exposed to air. When lac is used to make lacquer, the evaporating solution used is ethyl alcohol. These lacquers are made in all colors that are commonly found in paints.

In the Orient, a natural lacquer is obtained from the sap of the lacquer, or varnish, tree. The Japanese and Chinese tap the tree and collect the sap. Then they strain the sap, and dry it by heat. This makes a dark-brown liquid as thick as sirup. The liquid is diluted and sometimes colored before it is used as lacquer.

Modern lacquers are used to finish thousands of materials, including metals, paper, wood, and fabrics. The paper industry uses both clear and colored lacquers to finish packages, labels, and book covers. In the furniture industry, lacquers are especially useful in retaining the color of blond furniture. They also give a waterproof finish to furniture. In the automobile industry, lacquers are used to give a high gloss to automobile finishes. Acrylic-resin lacquers make an excellent coating for polished metals such as brass and chromium. WILLIAM M. MILLIKEN

Chicago Natural History Museum

Buddhist Head was carved from hardened lacquer. This head probably dates from the Sung dynasty in China.

See also CELLULOSE; LAC; RESIN; VARNISH.

LACQUER WARE is a beautiful Oriental product made by applying many coats of a certain varnish to such articles as trays, boxes, dishes, vases, and furniture. The true lacquer of China and Japan comes from the sap of the lacquer tree (*Rhus verniciflua*), which grows in China. But the shellac and nitrocellulose compositions made in Europe and America are also often called lacquer.

The Art Institute of Chicago

A Carved Chinese Plate of Red Lacquer Ware, made about 1300, has a design of peony flowers, buds, and leaves.

The Japanese learned the process of lacquering from China, probably in the A.D. 500's. The treasure of the Shoshoin in Nara, Japan, found in 756, has early examples of Chinese lacquer.

A piece of Japanese lacquer ware has a foundation of wood, sometimes as thin as paper, with perhaps 35 thin coats of black lacquer. Each coat is dried and highly polished before the next one is put on. The pictures are drawn with powders of various colors. They are protected with a coat of transparent lacquer.

Good lacquer wares are works of art. They are so durable that they show no wear for hundreds of years. A collection of lacquer ware recovered from a sunken ship was exhibited in Vienna in 1878. Eighteen months of exposure in sea water had failed to damage the lacquer. WILLIAM M. MILLIKEN

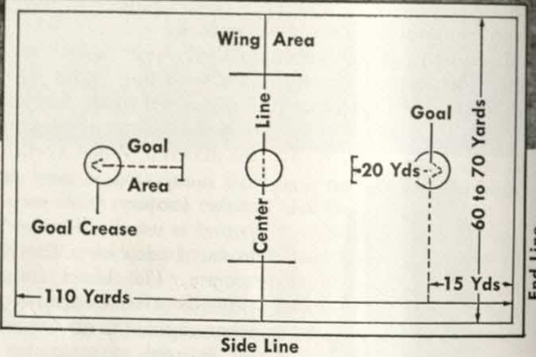
See also JAPANNING; LACQUER.

LA CROSSE, Wis. (pop. 47,575; alt. 650 ft.), is a manufacturing and trading center at the junction of the La Crosse and Mississippi rivers in the southern part of the state. For location, see WISCONSIN (color map). It ranks as Wisconsin's largest city on the Mississippi. The city is named after the Indian game of lacrosse. Founded in 1842, and chartered as a city in 1856, La Crosse early became an important sawmill center and manufacturing point for agricultural machinery. Today, the city makes aircraft instruments, automobile parts, air-conditioning equipment, farm tools, and rubber boots and shoes.

La Crosse serves as the home of Viterbo College, and one of Wisconsin's state colleges. There are also about 30 primary and secondary schools. La Crosse has a mayor-council form of government, and is the county seat of La Crosse County. JAMES I. CLARK

Wide World

Lacrosse Is a Fast, Rough Sport popular in Canada and along the East Coast in the United States. The players try to kick or throw a small ball into their opponent's goal with *crosses*, or sticks that have a net at one end. The sport developed from an Indian game, and resembles ice hockey in its style of play, the equipment worn, and the playing area used, *right*.



LACROSSE, *luh CROSS,* is a hard, fast game adopted from the North American Indians. It is widely played in Canada and the eastern part of the United States. The players are equipped with sticks that have a net at one end. The object of the game is to throw, scoop, or kick a small sponge-rubber ball into the opposing team's goal. The word *lacrosse* comes from the French words *la crosse,* meaning *the stick.*

Men's Lacrosse is played on a field 110 yards long and 60 to 70 yards wide. The goals are 80 yards apart and are centered between the side lines with 15 yards of playing area behind each goal. The goals are made of netting fixed between two poles 6 feet high which are placed 6 feet apart and joined at the top by a rigid crossbar. A circle with an 18-foot diameter is called the *goal crease* and surrounds each goal. A center line is drawn across the middle of the field.

Each player has a hickory stick called a *crosse* which he uses to throw or carry the ball. One end of the stick has a loose net called a *face* which serves the same purpose as the pocket in a baseball player's glove. The sticks range from 3 to 6 feet long, and the faces from 7 to 12 inches wide. Attacking players usually use shorter sticks than defensive players. The players wear shorts, cleated shoes, helmets, and padded gloves. The ball used in lacrosse is slightly smaller than a baseball.

A team consists of 10 men: a goalkeeper; three defense men named *point*, *cover point*, and *first defense;* three midfielders called *second defense*, *center*, and *second attack;* and three attack players called *first attack*, *out home*, and *in home*. Each team must always have three players on the offensive side of the center line and four on the defensive side. The goalkeepers are the only players allowed to touch or bat the ball with their hands.

A game is 60 minutes long, and is divided into four 15-minute quarters. At the beginning of each quarter and after each goal, play starts in the center of the field. The referee places the ball between the sticks of the two center players who try to gain possession of it at the referee's signal. The ball is carried in the stick and passed or kicked from player to player in an effort to get it in the opponents' goal. Opposing players may block each other. The game, with its goals, sticks, manner of play, and penalty system closely resembles ice hockey (see ICE HOCKEY).

Women's Lacrosse is played on a field 90 to 110 yards long. The side lines are the natural boundaries of the field. A team consists of 12 players. A game is 50 minutes long, divided into 25-minute halves with a 10-minute intermission between halves. Women's rules do not allow body contact.

History. Lacrosse developed from a game played by Canadian Indians. The Indian game was a rough, often brutal sport in which the sticks were frequently used as clubs to strike opponents. As many as a thousand warriors might take part in a game and the game might range over several miles of territory. Canadians took over the Indian game and there was a Montreal Lacrosse Club as early as 1839. It established the first rules in 1867, and founded the National Lacrosse Association. The Mohawk Club of Troy, N.Y., pioneered the game in the United States in 1868. Eastern universities in the United States held regular matches as early as 1881. The first intercollegiate lacrosse association was formed in 1884.

WILLIAM KELSO MORRILL

LACTALBUMIN. See ALBUMIN.

LACTATION OF COWS is the giving of milk by cows. The lactation period usually lasts about 10 months after the cow gives birth to a calf. The amount of milk is greatest immediately after the calf is born, declining about 9 per cent a month until the cow is dry.

LACTEAL. See INTESTINE.

LACTIC ACID (chemical formula, $C_3H_6O_3$) is the substance formed in milk when it sours. The name *lactic* comes from the Latin word *lac*, meaning milk. Ordinary lactic acid is the most important of several acids called lactic. All of them contain carbon, hydrogen, and oxygen. The atoms of these elements are grouped differently in each of the lactic acids. The same acid is developed in cream when it is *ripened* before being churned into butter.

Ordinary lactic acid, when pure, is a transparent, colorless, sirupy liquid. It is produced by fermentation. A watery solution containing from 2 to 80 per-cent ordinary lactic acid is used as a drug. It is sometimes used to dissolve the membranes that form in cases of diphtheria. It is also frequently used in the treatment of stomach disorders.

Sarcolactic acid has the same chemical composition as ordinary lactic acid. It is found in the blood, and is an important part of the muscles. It has been called the "acid of fatigue." This is because a greater amount of sarcolactic acid is present in the muscles when a person is tired. GEORGE L. BUSH

See also ACID.

LACTOMETER. See HYDROMETER.

LACTOSE. See CARBOHYDRATE.

LACY GLASS. See GLASSWARE (Early Glassware).

LADD, EDWIN FREMONT. See NORTH DAKOTA (Famous North Dakotans).

LADIES' GARMENT WORKERS' UNION, INTERNATIONAL. See GARMENT WORKERS' UNION, INTERNATIONAL LADIES'.

LADING, BILL OF. See BILL OF LADING.

LADINOS. See GUATEMALA (The People).

LADOGA, LAKE. See LAKE LADOGA.

LADRONE ISLANDS. See MARIANA ISLANDS.

LADY is a member of the nobility or the wife of a nobleman. In Great Britain, a woman who holds a title in her own right, including *marchioness*, *countess*, *viscountess*, or *baroness*, ranks as a lady. The daughter of a duke, marquis, or earl is also called a lady. The wife of a knight or baronet carries the title *lady*, but loses it if her husband dies and she marries a commoner. A lady of the royal household is a *lady in waiting*, and a lord mayor's wife is a *lady mayoress*. The first ladies gained seats in the House of Lords in 1958. I. J. SANDERS

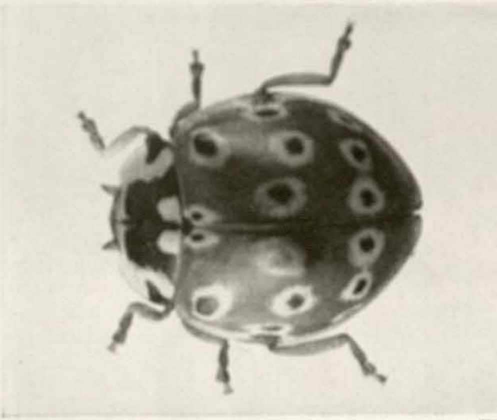
See also NOBILITY; TITLE OF HONOR.

LADY AMHERST'S PHEASANT. See BIRD (Bird Courtship; color picture, Birds of Other Lands); PHEASANT.

LADY GODIVA. See GODIVA, LADY.

LADY OF THE LAKE. See SCOTT, SIR WALTER.

LADYBUG, or **LADYBIRD,** is a small beetle with a round body shaped like half a pea. It is often bright red or yellow, with black, red, white, or yellow spots. Ladybugs feed chiefly on plant lice and scale insects. For this reason, fruitgrowers find ladybugs helpful. During the early 1900's, plant lice almost destroyed the fruit crop of California, and ladybugs were brought in to destroy the plant lice and save the crop. There are two kinds of ladybugs that harm beans, melons, squashes, and other garden plants. But the work of the beneficial kinds far outweighs the damage done by the few harmful ones.



USDA

Brightly-Colored Ladybugs help fruit growers by eating the tiny plant lice that are so destructive to fruit crops.

Scientific Classification. Ladybugs are in the order *Coleoptera* and make up the family *Coccinellidae*. There are about 150 species in the United States. R. E. BLACKWELDER

See also APHID; BEETLE (color picture); INSECT (Helpful Insects).

LADY'S-EARDROP. See FUCHSIA.

LADY'S-SLIPPER, also called *moccasin flower*, is any one of several showy wild flowers of the orchid family. The plants grow in moist woodlands of many parts of Europe, Asia, and America. The blossoms have a saclike lip with the shape of a slipper or moccasin.

The *showy lady's-slipper*, or *pink and white lady's-slipper*, is the state flower of Minnesota. Its large flowers are white, but its lip is tinged with brilliant pinkish purple. The *yellow lady's-slipper* has beautiful waxy yellow flowers. Its petals twist in a spiral. The *pink lady's-slipper* is the provincial flower of Prince Edward Island. The blossoms have a velvety pink or white lip with reddish veins and greenish brown sepals. The *small white lady's-slipper* grows in bogs and marshy meadows.

Scientific Classification. Lady's-slippers belong to the orchid family, *Orchidaceae*. They make up the genus *Cypripedium*. The showy lady's-slipper is genus *Cypripedium*, species *reginae;* the yellow, *C. calceolus;* the pink, *C. acaule;* and the white, *C. candidum.* ROBERT W. HOSHAW

See also MINNESOTA (color picture, The State Flower); PRINCE EDWARD ISLAND (color picture, Provincial Flower).

LADY'S-THUMB. See SMARTWEED.

LAËNNEC, *LAY NECK*, **RENÉ THÉOPHILE HYACINTHE** (1781-1826), a French physician, invented the stethoscope in 1816. Doctors use this instrument to listen to the sounds of the heart and other organs. Laënnec investigated diseases of the heart and the lungs, and published his conclusions in *A Treatise on Mediate Auscultation* (1819). He became an expert on tuberculosis, from which he died. Laënnec was born in Quimper, France, and studied with Jean Nicolas Corvisart, Napoleon's favorite physician. GEORGE ROSEN

See also STETHOSCOPE.

Addison Gallery of American Art, Phillips Academy, Andover, Mass.

Culver

John La Farge, above, is best known for his murals and work in stained glass. *Maua, Our Boatman,* left, shows the influence of his travels to Samoa and the South Sea Islands in the 1880's.

LA FARGE, *luh FARZH,* **JOHN** (1835-1910), was a distinguished American painter. He is often called "the father of mural painting in America." His greatest mural, painted in 1885, is in the chancel of the Church of the Ascension in New York City. In 1876, he decorated Trinity Church in Boston, his first important work. La Farge also attracted praise for his bright water colors, his work in stained-glass windows, and as a teacher of young painters.

La Farge was born in New York City, of French parentage. He studied painting in Paris, then returned to New York City to study law. But he disliked this subject, and went to Newport, R.I., to work with painter William M. Hunt. La Farge later traveled and painted in Japan and the South Seas. Edwin L. Fulwider

Oliver La Farge

Houghton Mifflin Co.

LA FARGE, OLIVER HAZARD PERRY (1901-), won a Pulitzer prize in 1930 for his first novel, *Laughing Boy,* a story about the Navaho Indians. He served as president of the National Association on Indian Affairs and its successor, the American Association on Indian Affairs from 1933 to 1942. La Farge's writings describe Indian culture and criticize the treatment of the Indians by the United States government. His works include *The Year Bearer's People* (1931), *The Enemy Gods* (1937), *A Pictorial History of the American Indian* (1956), *Behind the Mountains* (1956), and *A Pause in the Desert* (1957).

La Farge was born in New York City, the grandson of painter John La Farge. He studied archaeology and ethnology at Harvard University. Bernard Duffey

LAFAYETTE, Ind. (pop. 42,330; alt. 550 ft.), lies in the center of a rich farming region in the west-central part of the state. It is on the Wabash River about 60 miles northwest of Indianapolis (see Indiana [map]). Industries include a branch plant of the Aluminum Corporation of America. Lafayette was named for Marquis de Lafayette, the French statesman. The city is the home of the Lafayette Art Museum. West Lafayette, a suburb across the Wabash, is the home of Purdue University. The site of the Battle of Tippecanoe is preserved as a state park seven miles north of Lafayette. The seat of Tippecanoe County, Lafayette has a mayor-council form of government. Paul E. Million, Jr.

LAFAYETTE, La. (pop. 40,400; alt. 40 ft.), is an industrial and marketing center for a fertile farming region. The city is also known for its beautiful gardens. Three annual flower shows attract many visitors. Lafayette lies in the heart of the *Cajun* or *Evangeline* country of southwestern Louisiana, 125 miles west of New Orleans. For location, see Louisiana (color map). Lafayette has sugar mills, cotton gins, cottonseed-oil mills, rice mills, and other industries.

The first settlers of Lafayette were Acadians who came from Nova Scotia around 1770. The city was laid out as Vermilionville in 1824. The name was changed to Lafayette in 1884. The city is the home of the University of Southwestern Louisiana. Lafayette has a commission form of city government. Edwin A. Davis

LAFAYETTE, MARQUIS DE (1757-1834), was a French soldier and statesman. He fought for American independence and was a prominent leader in the French Revolution. His liberal beliefs cost him his fortune, his social position, and even his freedom, but his actions won the respect of Americans and Frenchmen alike.

Lafayette was born at Chavaniac, in Haute Loire, on Sept. 6, 1757. His full name was MARIE JOSEPH PAUL YVES ROCH GILBERT DU MOTIER. His father died in battle when the boy was 2 years old. When his mother and grandfather died 11 years later, he inherited a great fortune. Lafayette came from a long line of soldiers and studied at the Military Academy in Versailles. At the age of 16, he married Adrienne de Noailles, a daughter of one of the most influential families in France. Shortly afterward, he became a captain in the cavalry.

Service to the United States. Lafayette disliked court life. He welcomed the American Revolution as an opportunity to win military glory by fighting against England for France. He purchased a ship and landed in America in 1777 with a party of soldier-adventurers. The 20-year-old marquis impressed the Continental Congress. He was made a major general without pay, and joined George Washington's staff.

Lafayette was wounded at the battle of Brandywine. At Gloucester, he defeated a small party of Hessians. This earned him the command of a division. He served at Valley Forge during part of the terrible winter of 1777-1778. Early in 1778, at Albany, N.Y., he was given command of a proposed invasion of Canada. The plan was abandoned because of the mismanagement of others. He led troops in the battles of Barren Hill and Monmouth, and in the campaign of Rhode Island.

In 1779, after France declared war on England, Lafayette returned home as a hero. He hoped to join an invasion of England, but it never took place. Instead, he persuaded his government to send aid to the American colonists.

In April, 1780, Lafayette returned to his post as major general in the American army. Later that year, he served in the court-martial that condemned Major John André to be hanged as a spy for plotting with Benedict Arnold to surrender West Point (see ANDRÉ, JOHN).

In 1781, Lafayette led a small American force in Virginia that evaded and then stopped the British under General Charles Cornwallis. After the French fleet bottled up the English at Yorktown, Lafayette cooperated with the Comte de Rochambeau and Washington in forcing Cornwallis to surrender.

Marquis de Lafayette, *left,* helped the colonists win independence in the Revolutionary War in America. He returned to the United States in 1824, spending a night at Montpelier, Vt. He toasted the town for bravely supporting "the republican cry for independence and freedom."

Chicago Historical Society; National Life Insurance Co.

Culver

Lafayette and Washington began their lifelong friendship when Lafayette volunteered to serve the United States during the Revolutionary War. Lafayette spent much personal time and his fortune to aid the United States.

Lafayette had become a "hero to two worlds" when he reached France in 1782. He assisted in the negotiations that won American independence, and, at the age of 24, was raised to the rank of *marechal-de-camp* (brigadier general) in the French Army by King Louis XVI. He was now influential in both America and in France. At home in France, he cooperated closely with Benjamin Franklin, and later with Thomas Jefferson, in behalf of American interests.

Later Visits to America. Lafayette revisited America in 1784 and stayed at Mount Vernon with Washington. He came again in 1824. Both times, a grateful nation received him with enthusiasm. American appreciation also took the form, in 1803, of a huge land grant to Lafayette in Louisiana. During his last visit, Congress voted him $200,000 and a township in Florida. Lafayette had by that time lost nearly all his French properties. He sold most of his American land.

Reforms at Home. After 1782, Lafayette became absorbed in the questions of free trade, tax reform, emancipation of slaves, and religious freedom for Protestants. In the events leading to the French Revolution in 1789, he did not hesitate to sacrifice court favor and position in behalf of his liberal ideas. He was one of the first to advocate a National Assembly, and worked to make France a constitutional monarchy.

As commander of the new National Guard, Lafayette was one of the most powerful men in France from 1789 to 1791. But he did not believe in seizing power for himself. He was unwilling to work with the corrupt but able Comte de Mirabeau. Queen Marie Antoinette and her court resented Lafayette. She said: "It would be better to perish than be saved by M. de Lafayette." As radicalism spread, Lafayette found it necessary to suppress mob violence. By the summer of 1791, his popularity had gone. He found himself hated by the people, the former nobles, and the court.

After the Constitution of 1791 went into effect, Lafayette temporarily retired from active politics. When war with England broke out in the spring of 1792, he took charge of troops in the Netherlands area. As the military front collapsed, he unsuccessfully tried to suppress the rising tide of Jacobin radicalism at home (see JACOBIN). But the king and queen would not accept his help, and the troops he tried to turn on the Paris mob would not follow his orders. Lafayette, now widely denounced as a traitor, fled abroad for his life. The Austrians imprisoned him in 1792 until Napoleon's victories won his release in 1797.

The impoverished Lafayette returned to France when Napoleon became first consul in 1799. He refused to help Napoleon's dictatorship, rejecting a seat in the senate and a diplomatic post in the United States. In 1815, after his first abdication, Napoleon returned from Elba and gave France a liberal constitution. Lafayette was elected to the Chamber of Deputies. As one of the chamber's vice-presidents, he worked for Napoleon's second abdication after the battle of Waterloo.

Except for the reactionary periods of 1815 to 1817 and 1824 to 1827, Lafayette continued to serve in the Chamber of Deputies. He became a center of liberal resistance to the Bourbon kings. He upheld American interests, and fought for the cause of independence and reform in Greece, Spain, Portugal, Italy, Poland, and the South American republics.

Last Years. Once more, in 1830, Lafayette became the leader of a revolution that dethroned the Bourbons. Again in command of the National Guard, he refused a popular demand that he become president of the new republic. Instead, he used his influence to make Louis Philippe the constitutional monarch of France. But Lafayette came to regret this decision and, before his death in 1834, he began to hope for a pure republic. His grave in Picpus Cemetery in Paris was covered with earth from Bunker Hill. In the United States he received the same military honors that had been given George Washington. RAYMOND O. ROCKWOOD

See also BARTLETT, PAUL W.

LAFAYETTE COLLEGE is a liberal arts and engineering school for men in Easton, Pa. It is connected with the Presbyterian church, and grants B.A. and B.S. degrees. The college has a department of international affairs which prepares men for overseas service in diplomacy, business, and other work. Lafayette was founded in 1826. For enrollment, see UNIVERSITIES AND COLLEGES (table). GUY E. SNAVELY

LAFAYETTE NATIONAL PARK. See ACADIA NATIONAL PARK.

Culver

Buccaneer Jean Laffite refused an offer to join the British, then gave British plans for an attack on New Orleans to the United States. Laffite took part in the battle of New Orleans.

LAFFITE, *lah FEET,* **JEAN** (1780?-1826?), was a New Orleans smuggler, pirate, and patriot. In 1810, he became chief of a band of outlaws with headquarters on Grande Terre Island in Barataria Bay in the Gulf of Mexico. With his brother Pierre, he commanded a fleet of ships and raided both Spanish and neutral vessels in the Gulf. His ships flew the flags of the Central and South American nations that were revolting against Spain.

In 1813, Governor William Claiborne of Louisiana offered $500 for Laffite's capture. Laffite, then at the height of his power, boldly offered $1,500 for the governor's head. All efforts to take and prosecute Laffite under the law failed.

In 1814, the British were at war with the United States. They offered Laffite $30,000, a pardon, and a naval captaincy if he would aid them in attacking New Orleans. He refused, informed the United States government of the plans, and offered the services of the Barataria smugglers to the United States. Laffite fought for General Andrew Jackson in the battle of New Orleans on Jan. 8, 1815, and received a pardon from President James Madison.

American forces had destroyed the community at Barataria, so Laffite moved to Galveston Island. There, he established a town called Campeachy, and returned to piracy. He made himself "governor" of the island. After he raided the Louisiana coast and scuttled an American ship, the United States sent an expedition in 1821 to destroy the Galveston pirate colony. Laffite, who in spite of his swagger could be a gallant gentleman, quietly yielded, set fire to his town, and sailed away. Most historians believe that he died either in exile in Yucatán or in battle. Jean Laffite was born in France.

WILLARD H. BONNER

See also LOUISIANA (Interesting Places to Visit [Grand Isle]).

LA FOLLETTE, *luh FAHL et,* is the name of a family of American statesmen.

Robert Marion La Follette, Sr. (1855-1925), sometimes called "Battling Bob," was an American political leader and reformer. For 25 years, he ranked as the most important figure in Wisconsin politics.

La Follette became a lawyer in 1880, and a United States Congressman in 1885. Following his defeat in the election of 1890, he practiced law in Madison, Wis. He became the leader of a group within the Republican party that opposed the conservative state leadership. Elected governor in 1900, La Follette made Wisconsin outstandingly progressive. At his urging, the legislature provided for direct primary elections, equalization of taxation, and control of railroad rates.

From 1905 to 1925, La Follette served as a United States Senator. He advocated strict railroad regulation, lower tariffs, and better conditions for American seamen. He opposed American entry into World War I and U.S. membership in the League of Nations.

Culver Service

Robert M. La Follette, Sr.

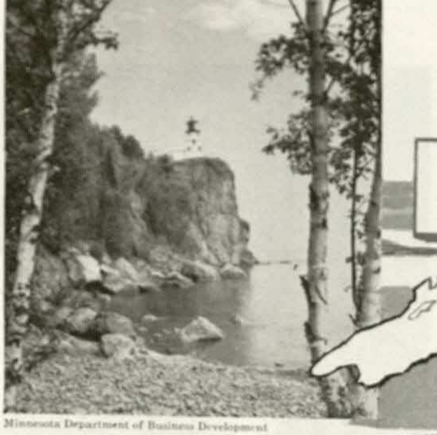
La Follette broke with the Republicans in 1924 when Calvin Coolidge was nominated for President. La Follette accepted the presidential nomination of a new Progressive party, backed by independents and many labor groups. He received almost 5,000,000 popular votes, but carried only Wisconsin. La Follette was born at Primrose, Wis. He represents the state of Wisconsin in Statuary Hall. See PROGRESSIVE PARTY.

Robert Marion La Follette, Jr. (1895-1953), was elected United States Senator from Wisconsin after his father's death. He supported the rights of organized labor and led a movement to increase the efficiency of Congress. The Wisconsin Progressives, under La Follette's leadership, continued as an independent party until 1946, when they rejoined the Republicans. La Follette was defeated in a try for renomination to the Senate in the 1946 Republican primary. He was born in Madison.

Philip Fox La Follette (1897-   ), second son of Robert La Follette, Sr., served as governor of Wisconsin from 1931 to 1933, and again from 1935 to 1939. During his terms in office, legislation was passed to aid labor and to help farmers and homeowners. La Follette was born in Madison.

NELSON M. BLAKE

LAKES OF THE WORLD



Minnesota Department of Business Development

Lake Superior, one of the five Great Lakes, is the largest body of fresh water in the world. It has an area of 31,820 square miles.

United Air Lines

Crater Lake in southwestern Oregon was formed by the natural collection of water in the crater of an extinct volcano.

Triangle

Lake Titicaca on the Peru-Bolivia border is the highest large lake in the world. The 3,200-square-mile lake lies 12,507 feet above sea level.

Utah Tourist and Publicity Council

Great Salt Lake in Utah is from four to seven times as salty as the ocean. Bathers float easily in it, knowing they will not sink.

LAKE is a body of water surrounded by land. Lakes may be found in all parts of the world. Some large bodies of water that are commonly known as seas are really lakes. These include the Dead Sea, the Sea of Galilee, and the Caspian Sea. Some lakes lie near the highest regions of the earth, and others are many feet below sea level. Lake Titicaca, in South America, is 12,507 feet above sea level. The Dead Sea, between Israel and Jordan, lies 1,292 feet below sea level. The word *lake* comes from the Greek word *lakkos*, meaning *hole* or *pond*.

The Life of a Lake

How Lakes Are Formed. The greatest number of lakes lie in regions that were once covered by glaciers. Glaciers cut deep valleys as they travel, and glacial deposits act as a dam. When a glacier begins to melt, its waters often collect in these valleys to form lakes. This action of glaciers explains why there are more lakes in the northern part of the United States than in the southern part. Minnesota has about 11,000 lakes formed by the action of glaciers. The Great Lakes were formed partly by glacial action.

Other areas that abound in lakes are regions lying on bedrocks of limestone, such as the Florida peninsula. More than 1,400 lakes and ponds lie in Lake County, Florida. In a limestone region, the underlying lime rock dissolves slowly in rain water, which is slightly acid. This action eventually forms a complicated pattern of underground streams to carry off the rainfall. When the tops of these subterranean passages collapse, a depression called a *sinkhole* appears on the surface. The sinkhole may then fill with water, forming a lake or pond.

Sinkholes may be 60 or more feet deep. They sometimes lie in the course of a fast-flowing underground stream. In such cases, the sinkhole fills quickly, forming a beautiful pool of crystal-clear water. Florida has many of these "springs," as they are known locally. The largest and best known is Silver Springs.

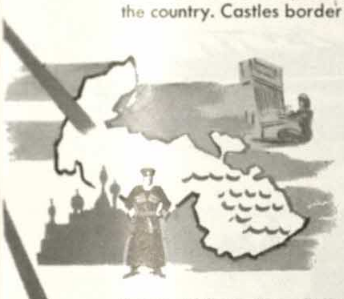
Lakes may also form in a number of other ways. The natural collection of rain water in the craters of extinct

Finnish National Tourist Office

Finland is called "The Land of Thousands of Lakes." About 60,000 add beauty to the country. Castles border some of them.

Harmon, Pix

Canada has many lovely lakes that attract vacationists and commercial fishermen. Some of the most spectacular ones lie in the Canadian Rockies.



Some Lakes Are Called Seas. The largest, the Caspian Sea, lies in Europe and Asia. The Dead Sea, *below*, is Asian.

James P. Barry, Pix

Switzerland is famous for its clear, blue lakes. They help make tourism one of the country's chief industries. One of the most popular lakes is the Lake of Lucerne.

volcanoes can create lakes. Crater Lake in Oregon was formed in this manner. Lakes may appear when rivers deposit silt until the natural outlet to the sea is closed, and the water backs up. Dam construction creates great artificial lakes called *reservoirs*. The lake behind the dam in Kariba Gorge, on Africa's Zambezi River, is more than 175 miles long.

How Lakes Are Fed. Rivers and mountain streams feed some lakes. Other lakes do not appear to have any water coming into them. They are actually fed by underground springs or streams. Still other lakes have inlets but no outlets. The Great Salt Lake of Utah is an example of this type of lake.

How Lakes Disappear. The lakes that now exist will probably disappear in time. Lakes dry up because of a change in climate or a change in the course of the waters that feed them. A bursting volcano or earthquake sometimes changes the surface of the surrounding region and causes lakes to disappear. Lakes may also drain into other bodies of water and vanish. Ground water fills the sinkholes in limestone areas. A long drought can completely dry up lakes and ponds in sinkholes. A seepage outlet in a sinkhole may also dry up a lake by draining the water into an underground cavern. Many low-lying regions on the earth's surface are the basins of old lakes. The dried-out beds of former lakes may form excellent soils.

The Lake Habitat. Lakes create little worlds of their own. Water plants of all shapes and sizes live under the surface. Some of the plants are attached to the lake bottom, and others float free. This vegetation provides food for water creatures such as bugs, snails, and fish. Lakes are also the favorite haunts of waterfowl such as ducks, geese, swans, flamingos, egrets, cranes, and others. Land animals use lakes for drinking water. They also get food from lakes in the form of fish, birds, and plant life.

Lakes and Man

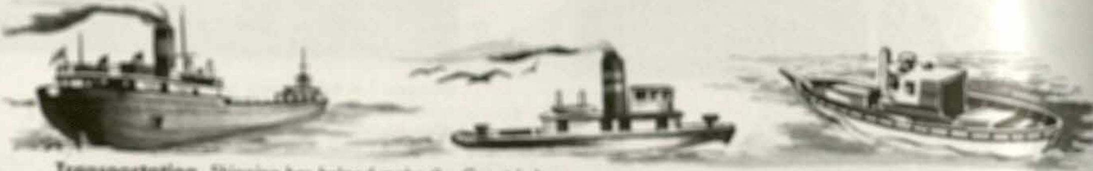
Climate. The presence of large lakes in a region greatly influences the lives of the people living nearby.

Michigan Tourist Council

The Soo Locks help ships pass between Lakes Superior and Huron. Thousands of ships every year can sail on both lakes because of these locks.

Lakeside Cities, such as Duluth, Minn., are economically important to many countries. Goods can be carried to and from them cheaply by water.

Duluth Chamber of Commerce



Transportation. Shipping has helped make the Great Lakes region one of the richest areas in the United States and Canada.

Irrigation. Both natural and man-made lakes store water that can be used to convert wasteland into fertile farm land.

Water Supply. Inland lakes provide water for nearby cities. Pipelines carry it from offshore intakes to purification plants.

Recreation. An almost endless variety of water sports offers a delightful means of recreation at thousands of lakeside resorts.

Lakes affect weather conditions for many miles around. In summer, a lake never gets as warm as the surrounding land. As a result, breezes blowing over the water are cooled. In winter, a lake does not cool off as fast as the land, and may cause the climate to be warmer.

Warm winds blowing off a lake in autumn make it possible for certain crops to grow especially well. The warming influence of Lake Ontario in autumn extends the growing season of southern Ontario, making it possible to raise fruits and corn. The great fruit belt of Michigan, along the east shore of Lake Michigan, depends partly on winds off the lake. Cool spring winds delay the blossoming of the fruit trees until the danger of a killing frost has passed. Warm winds in autumn allow the fruit crops to be harvested before the frost strikes. The thousands of lakes in central Florida have an important effect on the location of the state's citrus-fruit industry. Careful studies have shown that these lakes help reduce the damaging effects of cold spells which might otherwise cause considerable loss to fruitgrowers.

Travel and Trade Routes. The growth of travel and commerce on the Great Lakes provides a typical example of man's use of lakes. The early explorers of North America used lakes and their connecting rivers as their chief travel routes. Some of these explorers paddled canoes up the St. Lawrence River to the Great Lakes. Steamboats took the place of canoes as the civilization of the white man expanded. Freighters, tugboats, and barges now work their way along inland navigation routes on the Great Lakes, carrying raw materials to industrial cities along the lakes. Products carried on the lakes include coal, iron, and grain.

Irrigation. Lakes provide an important source of water for irrigation. Water may be fed from the lakes to farmers' fields by ditches or canals, or it may be pumped into an overhead system of sprinklers. Men have built huge dams on rivers in desert areas to create reservoirs of water for irrigation. The Egyptians built the Aswân Dam on the Nile River for this purpose. The British-built dams on the Indus River provide water to irrigate 36,500,000 acres of parched desert land. These irrigated regions, which lie mainly in Pakistan, supply food for millions of persons.

Water Supply has been a serious problem ever since men started to live in towns and cities. Lakes offered a natural reservoirs of water for early communities. But most cities today have outgrown such natural supplies, and men have built huge storage dams to provide additional water. The reservoirs formed by these dams sometimes lie many miles away from the city. For example, New York City uses water from the Catskill Mountains.

Recreation. People use lakes for a variety of recreational activities. They flock to lakes to enjoy fishing, boating, swimming, water-skiing, hunting, ice skating, and ice boating. In states such as Florida, the fresh-water recreational industry provides millions of dollars of income every year. [illegible]

Related Articles in WORLD BOOK include:

AFRICA

Lake Albert
Lake Bangweulu
Lake Chad
Lake Edward
Lake Nyasa
Lake Rudolf
Lake Tana
Lake Tanganyika
Lake Victoria

ASIA

Aral Sea
Caspian Sea
Dead Sea
Koko Nor
Lake Baykal
Lake Balkhash
Lake Urmia
Lake Van
Sea of Galilee

AUSTRALIA

Lake Eyre
Lake Torrens

CANADA

Bras d'Or Lake
Great Bear Lake
Great Lakes
Great Slave Lake
Lake Agassiz
Lake Athabasca
Lake Champlain
Lake Erie
Lake Huron
Lake Louise
Lake Manitoba
Lake Memphremagog
Lake of the Woods
Lake Ontario
Lake Saint Clair
Lake Saint Lawrence
Lake Superior
Lake Winnipeg
Lake Winnipegosis
Muskoka Lakes
Rainy Lake
Reindeer Lake
Wollaston Lake

CENTRAL AMERICA

Gatun Lake
Lake Nicaragua

EUROPE

Caspian Sea
Lake Albano
Lake Avernus
Lake Balaton
Lake Como
Lake Constance
Lake Garda
Lake Geneva
Lake Ilmen
Lake Ladoga
Lake Lugano
Lake Maggiore
Lake Nemi
Lake of Lucerne
Lake of Thun
Lake Onega
Lake Peipus
Lake Vänern
Lakes of Killarney
Loch Katrine
Loch Lomond
Loch Ness
Lough Neagh
Masurian Lakes
Windermere Lake

SOUTH AMERICA

Lake Maracaibo
Lake Titicaca

UNITED STATES

Canandaigua Lake
Crater Lake
Finger Lakes
Great Lakes
Great Salt Lake
Lake Agassiz
Lake Champlain
Lake Erie
Lake George
Lake Huron
Lake Mead
Lake Memphremagog
Lake Michigan
Lake of the Ozarks
Lake of the Woods
Lake Okeechobee
Lake Oneida
Lake Ontario
Lake Placid
Lake Pontchartrain
Lake Saint Clair
Lake Saint Lawrence
Lake Superior
Lake Tahoe
Lake Winnebago
Lake Winnipesaukee
Pend Oreille Lake
Rainy Lake
Reelfoot Lake
Salton Sea
Saranac Lakes
Utah Lake

UNCLASSIFIED

Lagoon
Lake Xochimilco
Limnology
Oxbow Lake

LAKE is a coloring substance that will not wash out. It is formed by combining *mordants* with dyestuffs. Mordants are usually metallic salts which change to metallic hydroxides. These react chemically with dyes to form the insoluble, colored lakes.

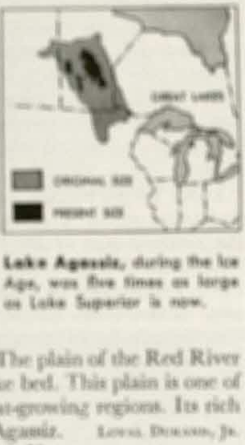
There are two kinds of lakes. One is produced from natural colors. The other is made from coal-tar colors. Natural lakes include carmine, madder, and the Vienna lakes. Carmine lake is prepared from the coloring matter of cochineal insects. Carmine lake is a beautiful scarlet color. Madder lake is red. It comes from the root of the madder plant. Vienna lake is a violet color and comes from brazilwood.

Coal tar lakes can give a much wider range of color. These dyes are produced at a much lower cost. They have almost entirely replaced the natural lakes. Lakes are used in calico-printing, silk-dyeing, for decorative work, color-printing, and also as color pigments in paints and lacquers. GEORGE L. BUSH

See also COCHINEAL; MORDANT.

LAKE AGASSIZ, *AG uh see,* was a large body of water which once existed in North America. It covered much of the area of present-day Manitoba, and portions of neighboring states and provinces. The lake came into existence late in the ice age (see ICE AGE). As the ice sheet which covered the area melted northward, it left a large, shallow basin behind it. The melting ice filled the basin with water to form Lake Agassiz. When the ice at the north shore of the lake melted still more, the waters of the lake drained away. Several smaller lakes were left in the deeper parts of the basin.

The shore lines of the ancient lake are still visible. The plain of the Red River of the North is the former lake bed. This plain is one of the world's most fertile wheat-growing regions. Its rich soil was deposited by Lake Agassiz. LEWIS DUNHAM, JR.



Lake Agassiz, during the Ice Age, was five times as large as Lake Superior is now.

See also RED RIVER OF THE NORTH.

LAKE ALBANO, *ahl BAH noh,* lies in the crater of an extinct volcano near Albano Laziale in west-central Italy. It is more than 500 feet deep. The ancient Romans spent vacations at this lake. It was then known as Albanus Lacus. According to legend, the city of Alba Longa was founded here by Ascanius, son of the Trojan warrior Aeneas.

LAKE ALBERT, or **ALBERT NYANZA,** one of the sources of the Nile River, lies between Uganda and the Republic of Congo. It is a long, narrow lake about 2,000 feet above sea level. Lake Albert covers about 1,640 square miles. It is about 100 miles long and about 20 miles wide. For location, see UGANDA (map). Its waters come from Lake Edward to the south through the Semliki River, and drain out to the north by way of the Albert Nile. Sir Samuel Baker discovered the lake in 1864, and named it for the husband of Queen Victoria of Great Britain. HARRY R. RUDIN

LAKE ATHABASCA is the fourth largest lake entirely within the borders of Canada. It has an area of 3,058 square miles, more than twice the size of Rhode Island. About a third of the lake lies in the northeastern part of the province of Alberta, and the rest in Saskatchewan. The Athabasca River flows into the southwestern tip of the lake. During the breeding season, large numbers of Canadian geese nest along the low, sandy shores of Lake Athabasca. Loyal Durand, Jr.

See also Alberta (Pioneer Days).

LAKE AVERNUS is a deep lake in the crater of an extinct volcano near Naples, Italy. The lake has a circumference of about two miles. In mythology, it was the entrance to the Lower World, where Pluto reigned (see Pluto [god]).

LAKE BALATON, *BAL uh tahn*, is one of the largest lakes in Central Europe. It lies in western Hungary, about 50 miles from the Yugoslavian border. Its German name is *Plattensee*, which means *flat sea*. Lake Balaton has an area of about 230 square miles. The northeast end of this shallow lake is about 55 miles southwest of Budapest. The lake is a fishing resort.

LAKE BALKHASH, *bahl KAHSH*, is a large lake in the southeast Kazakh Republic in Russia. The lake lies 780 feet above sea level. It has an area of 6,670 square miles, more than four times the size of Great Salt Lake in Utah. It is only 6 miles wide in the eastern part, and 54 miles wide at the western end. The water in the western part of the lake is fresh because of the inflow of the Ili River, but there is salt water at the eastern end. Several rivers empty into Lake Balkhash, but the lake has no outlet. Ice covers the lake from November to April. Theodore Shabad

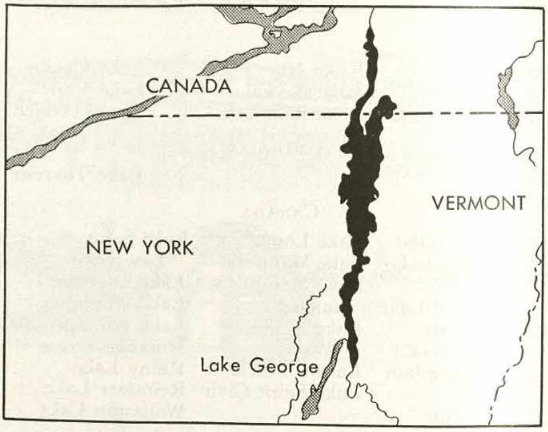
LAKE BANGWEULU, *BANG we OO loo*, is a shallow depression about 50 miles long and 30 miles wide in the northern part of the Federation of Rhodesia and Nyasaland. For location, see Rhodesia and Nyasaland, Federation of (map). Much of the surrounding area to the south and southeast consists of swamp, which floods during the rainy season. The normal size of the lake is about 1,900 square miles, but the flood waters increase it to about 4,500 square miles. The Luapula River, which flows out of the southern end of Lake Bangweulu, is one of the headstreams of the Nile River. David Livingstone, the British explorer, discovered Lake Bangweulu in 1868. He died near it in 1873. See also Stanley and Livingstone. Kenneth Robinson

LAKE BAYKAL, *by KAHL*, or **BAIKAL,** is the deepest fresh-water lake in the world and the largest lake in Siberia. It covers about 12,150 square miles in southern Siberia, a greater area than that of the state of Maryland. The greatest depth of the lake is more than 5,700 feet. Lake Baykal is long and narrow and stretches in a southwest-northeast direction. More than 300 rivers empty into the lake. The Angara River carries the overflow waters of Lake Baykal northward to the Yenisey River. Theodore Shabad

LAKE BONNEVILLE. See Great Salt Lake; Utah (Rivers and Lakes).

LAKE CHAD is a large lake in north-central Africa. Most of it lies within Chad, and the rest lies in Nigeria, Cameroun, and Niger. For location, see Africa (color map). Scientists think its average size expands and contracts in 10-year cycles, but its over-all size has shrunk for many years. It now has an area of about 6,300 square miles. Its shore line changes in relation to the quantity of water that rivers emptying into it pour into the lake, and the rate of water evaporation. It is much larger in rainy seasons than in dry seasons. Lake Chad is seldom deeper than 22 feet because its basin is so shallow that water overflows into the surrounding countryside. Many islands rise from the surface, which is covered by a tangle of grasses and weeds. This matted surface has caused many people to refer to the lake as "a drowned prairie." The lake's name in French is Lake Tchad. Alan P. Merriam

LAKE CHAMPLAIN, *sham PLAYN*, is a long, narrow lake lying on the border between New York and Vermont, with its northern end extending into the province of Quebec, Canada. For location, see New York (color map). The lake is 125 miles long and from about one half mile to 14 miles wide. It covers about 500 square miles. The lake was named for the French explorer Samuel de Champlain who discovered it in 1609. Summer homes and resorts lie on many islands in the lake. During the Revolutionary War and the War of 1812, the lake was of strategic military importance, and was the scene of several naval battles. William E. Young



Lake Champlain Lies Between New York and Vermont.

See also Champlain, Samuel de; Crown Point.

LAKE CHAMPLAIN, BATTLE OF. See War of 1812 (Chief Battles).

LAKE CHARLES, La. (pop. 63,392; alt. 20 ft.), is an industrial and trading center, and the largest city in southwestern Louisiana. It lies on the Calcasieu River about 50 miles from the Gulf of Mexico (see Louisiana [map]). A channel links the river and Gulf. Before 1900, Lake Charles was important only as a lumbering center. But other industries became important after oil and sulfur were discovered nearby. Industrial plants in the city produce chemicals, sulfur, lumber, synthetic rubber, and petroleum and food products. Lake Charles is an important rice-exporting center.

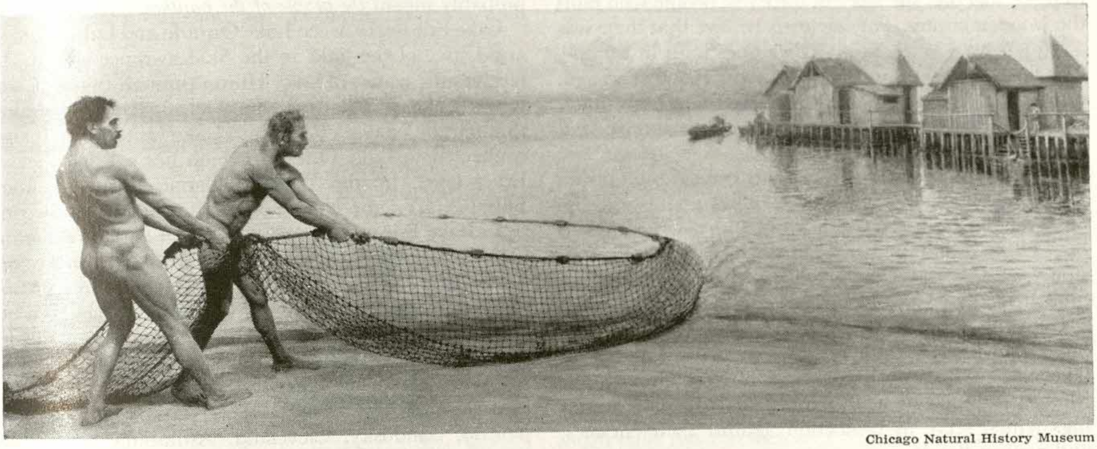
The first settlers came to the region about 1780, naming it Charlie's Lake. The name was later changed to Marion, then to Charleston, and finally Lake Charles. The city is the home of McNeese State College. It has a commission government. Edwin A. Davis

LAKE COMO, *KO mo,* is a famous beauty spot of northern Italy. Lake Como is called *Lago di Como* in Italian. It lies in the province of Lombardy at the foot of the Alps, which rise 7,000 feet behind the lake. The Lake covers an area of 56 square miles. Its shores are lined with handsome summer homes, fine gardens, and fertile vineyards. The River Adda runs through Lake Como. Thousands of tourists visit Como, the chief town on the lake, each year. W. R. McCONNELL

See also ITALY (picture, Sunny Italy).

LAKE CONSTANCE, or BODEN SEE in German, lies at the eastern end of the Swiss Plateau, at the border of Germany, Switzerland, and Austria. The lake covers 208 square miles. It is about 45 miles long and 10 miles wide. Of glacial origin, Lake Constance occupies a basin in the Rhine River. The Rhine Channel remains close to the Swiss side of the lake and drops several hundred feet. The level of the lake rises and falls with the melting of ice and snow in the neighboring Alps. Many towns and villages line the shore of the lake, including Constance and Romanshorn. Old castles, monasteries, and churches dot the countryside. Vineyards and orchards grow near the shore. FRANKLIN C. ERICKSON

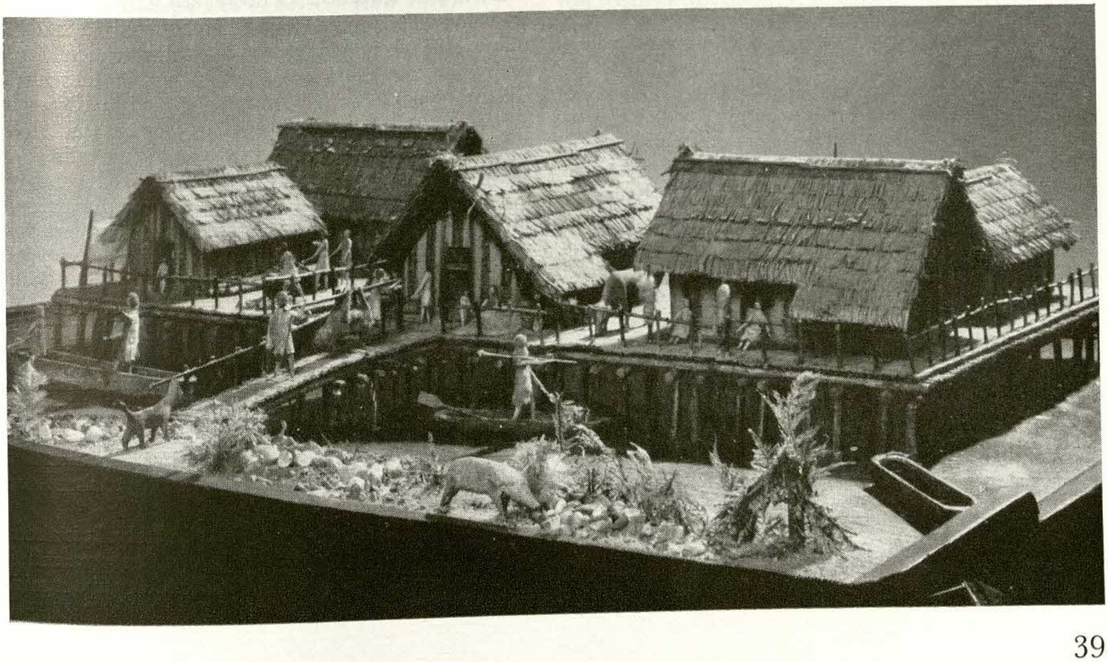
LAKE DWELLING. Early peoples in Europe sometimes built dwelling places in lakes, or at the edges of lakes or creeks. Scientists have come to call these primitive houses lake dwellings. The people placed their houses on wooden platforms which stood on *piles,* or posts. They drove the foundations deep into the mud, and often held them steady by stones stacked around their bases. Some of the houses were clustered together in villages.



Chicago Natural History Museum

Lake Dwellers of a Prehistoric Period, *above,* hauled in great nets full of fish near their homes on a lake in Switzerland. They protected themselves against human enemies and the many great beasts of prehistoric times by building their homes some distance offshore on posts set in the water. The model of a Swiss lake dwelling, *below,* shows a cluster of thatch-roofed homes. The wooden platforms that surrounded them served as walks, and also provided a safe place for domestic animals.

American Museum of Natural History



The Greek historian Herodotus, who lived in the 400's B.C., made the first known mention of lake dwellings. He wrote of a lake-dwelling community in Macedonia. Archaeologists first found the remains of prehistoric lake houses in 1853, in a lake near Zurich, Switzerland. The relics had been preserved by the waters of the lake, and by the mud of the lake bottom. Since 1853 scientists have found the ruins of lake dwellings in various parts of Switzerland, and also beside the lakes and streams of other countries in Europe. They have found weapons of bone, stone, and metal, as well as crude pottery bowls and dishes, near the sites of the lake dwellings. Some of the pottery vessels still contained bits of grains and fruits. Scientists believe that the pottery and weapons belonged to the owners of the lake dwellings.

Archaeologists have used the ruins of lake dwellings to piece together the story of the early people who built the wooden houses. The scientists believe that there was a sequence, or series, of lake dwellings built in Europe. The first, and finest, were put up about 5,000 years ago, during the Neolithic period, or New Stone Age. Later peoples built lake dwellings during the Bronze and Iron ages.

The early people of Scotland and Ireland built primitive dwellings called *crannogs* in lakes and bogs. The name comes from the Celtic word *crann*, which means *tree*. These rude houses were artificial islands of wood, stones, and earth. Wooden stakes driven deep into the mud held the islands in place.

Primitive tribes in some parts of the world still live in wooden houses built on piles over the waters of a lake or bay. Some of the people of New Guinea, the Malay Archipelago, and Venezuela build lake dwellings which serve as protection against their enemies, and against floods. CARLETON S. COON

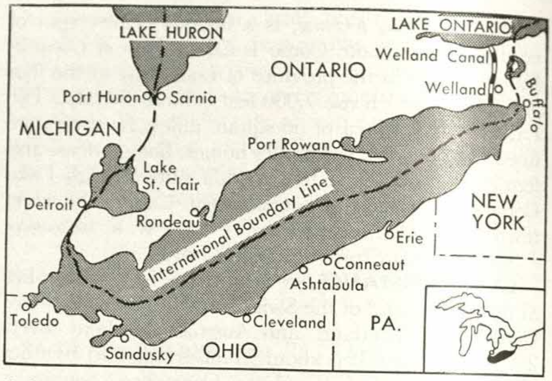
LAKE EDWARD is one of the sources of the Nile River. It lies in the rift valley of central Africa between Uganda and Congo. Most of the lake is in Congo territory. For location, see CONGO (map).

Lake Edward lies about 3,000 feet above sea level, and has a depth of over 360 feet. It is about 40 miles long and 32 miles wide, and covers 830 square miles. Fish life is abundant in the lake. The Semliki River flows north from Lake Edward into Lake Albert in a valley west of the Ruwenzori Mountains (see LAKE ALBERT).

Henry M. Stanley discovered the lake in 1889. The explorer named it for the Prince of Wales, later King Edward VII. Its original name was Albert Edward Nyanza. *Nyanza* means *lake* in the Bantu language. HARRY R. RUDIN

LAKE ERIE, lying on the international border between the United States and Canada, is the farthest south of the five Great Lakes of North America (see GREAT LAKES). It is bordered by the states of New York, Pennsylvania, Ohio, and Michigan, and the Canadian province of Ontario.

Lake Erie is about 240 miles long, and ranges between 38 and 57 miles in width. With an area of 9,940 square miles, it is the fourth largest of the five Great Lakes. It is a shallow lake, only 210 feet deep at its deepest point. For this reason, the lake is quickly stirred by storms and often has violent waves. Early French explorers called Lake Erie *Lac du Chat* (Lake of the Cat) because the Iroquois Indians called the tribe of Indians living near the lake *Erieehronons*. This Indian word probably meant *the people of the panther*.



Lake Erie Lies on the United States-Canadian Border.

Lake Erie lies between Lake Ontario and Lake Huron, and is one of the links in the St. Lawrence system. It receives the waters of Lake Huron through the St. Clair River, Lake St. Clair, and the Detroit River. It drains through the Niagara River into Lake Ontario. It is also connected to Lake Ontario, which lies 326 feet below Erie's level, by the Welland Canal. Eastward from Buffalo, N.Y., the New York State Barge Canal connects Lake Erie with the Hudson River and the Atlantic Ocean. Much of the heavy lake traffic terminates on Erie's southern shore. Iron ore and taconite from Minnesota and limestone from Michigan are shipped to Ohio ports for use in Ohio steel mills and for mills in Pittsburgh, Pa. Buffalo is the most important grain-shipping port on the lake, and Toledo, Ohio, is a busy coal shipping port. The principal Lake Erie ports are Toledo, Sandusky, Cleveland, Ashtabula, and Conneaut, all in Ohio; Erie, Pa.; and Buffalo. JOHN H. GARLAND

See also WELLAND SHIP CANAL.

LAKE ERIE, BATTLE OF. See WAR OF 1812 (Chief Battles).

LAKE ERIE COLLEGE is a liberal arts school for women at Painesville, Ohio. Courses are offered in teacher training, public-school music, physical education, home economics, art, dramatics, speech, nursing, and medical technology. The college was founded in 1856. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LAKE EYRE, *air*, is the largest lake in Australia. It is shallow and salty, and lies 39 feet below sea level. Eyre is nearly divided into two lakes. The northern part is 90 miles long and 40 miles wide, and the southern part 38 miles long and 16 miles wide. The lake covers 3,700 square miles. Cooper's Creek empties into Lake Eyre. See also COOPER'S CREEK. C. M. H. CLARK

LAKE FOREST COLLEGE is a coeducational liberal arts and sciences college at Lake Forest, Ill. It is affiliated with the Presbyterian Church. There are extension and summer courses. The school was founded in 1857 as Lind University. In 1865, it became Lake Forest University, still the legal name. The campus is located in a Chicago suburb. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LAKE GARDA is the largest lake in Italy. It is about 35 miles long and covers an area of 143 square miles. Lake Garda lies in beautiful Alpine country about midway between Milan and Venice.

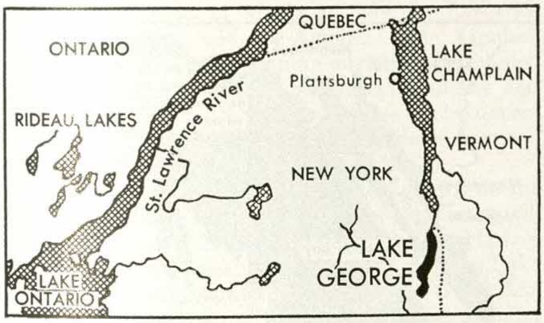
LAKE GENEVA is the largest lake in Central Europe. It is formed by a natural damming of the Rhône River. The lake has an area of 224 square miles, 141 square miles of which lie in Switzerland and the rest in France. Lake Geneva is crescent-shaped, and 43 miles long. Its name in French is Lac de Genève. This is the name used in France and in the French-speaking part of Switzerland. Sometimes it is also called Lac Léman in French. German-speaking people of Switzerland call it the Genfer See.

Lake Geneva is noted for its clear blue waters. Its greatest depth is 1,015 feet. A mountain region of great beauty, including the Bernese Alps and the Jura Mountains, surrounds the lake. The city of Geneva is at the western end of the lake, and the towns of Vevey and Montreux lie at the eastern end. On an island near the eastern shore stands the historic castle of Chillon, made famous by Lord Byron's poem, "The Prisoner of Chillon." On the north shore are the city of Lausanne and the resort of Ouchy. Franklin C. Erickson

See also Chillon.

LAKE GEORGE, in Australia. See Australia (Rivers).

LAKE GEORGE, in eastern New York, is a popular summer resort. This lake had a part in early American history. Battles were fought along its shores in both the French and Indian War and the Revolutionary War. The French, English, and Americans controlled it in turn. Early settlers called the lake *Horicon*. In 1755, General William Johnson named it for the British king, George II. Lake George is 36 miles long and from 1 to 3 miles wide. The lake empties into Lake Champlain to the north. William E. Young

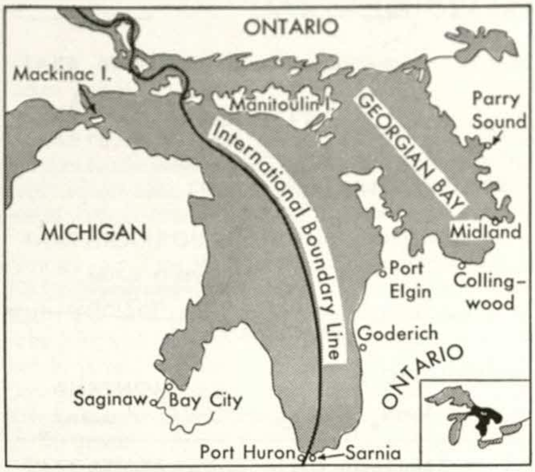


Lake George Lies in Eastern New York.

LAKE GÚANOCO. See Asphalt; Venezuela (Mining).

LAKE HURON is one of the five Great Lakes of North America. It was named for the Huron Indians who lived on its shores. Lake Huron lies between Lake Michigan and Lake Erie, and forms part of the boundary between the United States and Canada. The lake is about 250 miles long, and its greatest width is about 155 miles. Its area, including the North Channel and Georgian Bay, is 23,010 square miles. This is nearly the size of West Virginia.

Huron lies at the same level as Lake Michigan, 581 feet above sea level. Huron's waters are 21 feet below the level of Lake Superior, 8 feet above that of Lake Erie, and 334 feet above that of Lake Ontario. The deepest part of Lake Huron is 750 feet below the surface. The lake drains an area of 50,000 square miles.



Lake Huron Lies Between Lake Michigan and Lake Erie. The United States-Canadian boundary line passes through the lake.

The St. Marys River connects Lake Huron with Lake Superior, and the Straits of Mackinac connect it with Lake Michigan. The waters of Lake Huron flow into Lake Erie by way of the St. Clair River, Lake St. Clair, and the Detroit River.

These clear waters of Lake Huron have many kinds of fish. Small islands dot the northern surface of the lake. The two most important islands are Mackinac Island, in Michigan, and Manitoulin Island, in Ontario, Canada. Violent storms that frequently occur between December and May make Lake Huron dangerous for shipping during the winter. The shores of the lake are low except on the southeastern coast, where rough cliffs rise 150 feet. John H. Garland

See also Georgian Bay; Great Lakes.

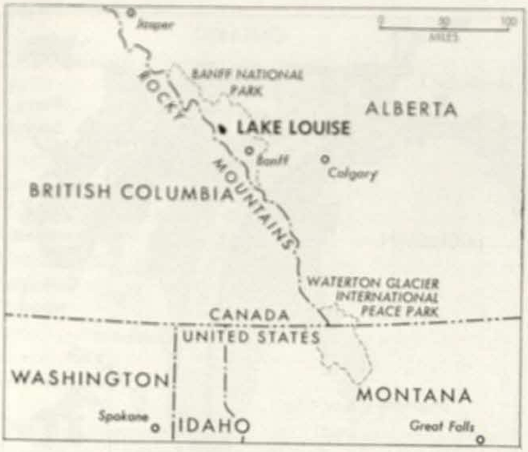
LAKE IJSSEL. See Netherlands (Reclamation and Conservation).

LAKE ILMEN, *IL mun*, is a fresh-water lake in Russia, just south of Novgorod. It is about 26 miles long and 21 miles wide. Rivers entering the lake include the Msta, Lovat, and Shelon. Lake Ilmen empties north through the Volkhov River into Lake Ladoga. The Msta and Volkhov rivers are connected by two canals, parts of the waterway system that extends from the Baltic Sea to the Black Sea. Robert O. Reid

LAKE ITASCA is the source of the Mississippi. See Mississippi River (Its Course).

LAKE LADOGA, *LAD ohguh*, in Russia, is the largest lake in Europe. It forms part of a canal system that connects the Baltic and White seas. The lake lies 40 miles northeast of Leningrad. It covers 7,000 square miles. For many years part of the lake belonged to Finland, but in 1940 the entire waterway became Russian territory. Several canals have been built along the shores of Lake Ladoga. Theodore Shabad

LAKE LOUISE, located in Banff National Park in southern Alberta, is called *The Pearl of the Canadian Rockies*. For location, see Alberta (color map). The lake is quiet and peaceful because it is so shut off by the Rockies that winds do not stir its surface. The changeable blue waters of the lake mirror the colors and shapes of the sky, clouds, dark forests, cliffs, and snowy mountains. More people visit Lake Louise and



Lake Louise Lies in Southern Alberta.

Banff National Park than any other places in the Canadian Rockies. A large hotel on the shore accommodates many of the tourists. Lake Louise is about 1½ miles long. See ALBERTA (color picture). D. F. PUTNAM

LAKE LUGANO, *loo GAH noh,* lies at the southern foot of the Alps between Lakes Maggiore and Como. For location, see SWITZERLAND (color map). The River Tresa connects Lugano and Maggiore. Lake Lugano extends from northern Italy into southern Switzerland. It covers 19 square miles, and is 20 miles long and 2 miles wide.

LAKE MAGGIORE, *mahd JOH ray,* is one of the best-known lakes in Italy. Most of it lies in Italy, but a small part in the north extends into Switzerland. The Italians call this lake *Lago Maggiore,* which means *greater lake.* Lake Maggiore is 40 miles long and covers 82 square miles. The surface is 632 feet above sea level. In some places the lake is more than 1,200 feet deep. High mountains north and west of the lake rise 7,000 feet above sea level. On the south are hills covered with vineyards. The most important cities on the lake are Locarno, Palanza, and Streza. SHEPARD B. CLOUGH

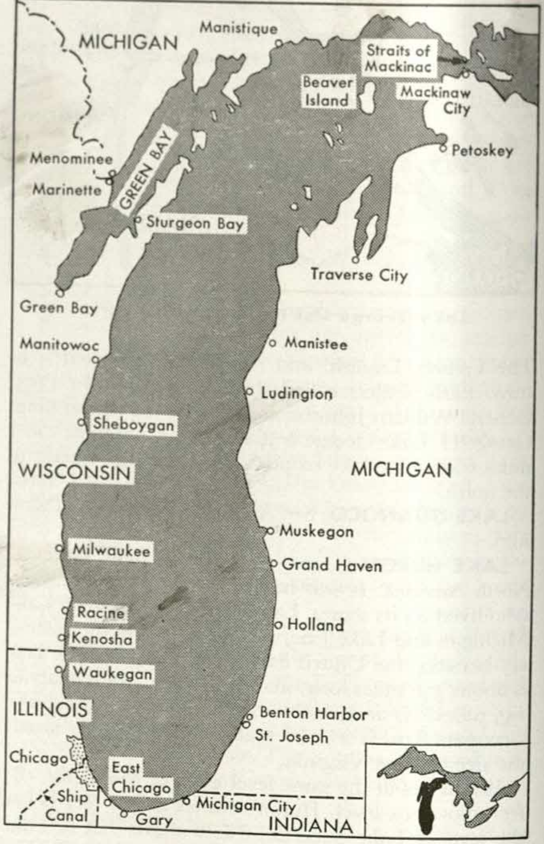
LAKE MANITOBA is the third largest lake in the Canadian province of Manitoba. It and Lakes Winnipeg and Winnipegosis are called *the Great Lakes of Manitoba.* Lake Manitoba lies in the south-central part of the province. For location, see MANITOBA (color map). It is about 135 miles long and 25 miles wide. The lake covers an area of 1,817 square miles. Lake Manitoba lies 60 miles west of Lake Winnipeg. Waters from it flow into Lake Winnipeg through the Dauphin River. Fisheries on Lake Manitoba are less important than those on Lake Winnipeg. But wild animals along the lake provide good hunting. LOYAL DURAND, JR.

LAKE MARACAIBO, *MAR uh KYE boh,* is the trade waterway of the farming and rich petroleum region of northwestern Venezuela. For location, see VENEZUELA (color map). Lake Maracaibo is the largest lake in South America. It is connected with the Caribbean Sea by a short channel and the Gulf of Maracaibo. Lake Maracaibo has an area of 6,300 square miles. Among the streams that empty into the lake are the Cataumba, Motatán, Bravo, Chama, and Zulia rivers. The lake is important because of the large number of oil wells in it and on its shores. W. DONALD BEATTY

LAKE MEAD is the reservoir behind Hoover (Boulder) Dam, and one of the world's largest artificial lakes. It lies north of the dam, about 15 miles east of Las Vegas, Nev. Lake Mead is 115 miles long and stores about 32,300,000 acre-feet of water. It has an area of 228.83 square miles. The lake is the center of a playground region. The National Park Service administers Lake Mead. See also HOOVER DAM; NEVADA (color picture, Hoover Dam).

LAKE MEMPHREMAGOG, *MEM fruh MAY gahg,* lies on the boundary between the United States and Canada. About a third of the lake is in Vermont and the rest is in the province of Quebec. Lake Memphremagog is about 30 miles long and from 2 to 5 miles wide. It empties into the St. Lawrence River through the Magog and St. Francis rivers. The shores of Memphremagog are known for their beautiful scenery. Summer cottages and estates surround the lake. Newport, Vt., is at the southern end, and Magog, Que., is at the northern end of the lake. M. G. BALLANTYNE

LAKE MICHIGAN is the largest body of fresh water in the United States. It is the third largest of the Great Lakes and the only one of the group that lies entirely inside the United States. Lake Michigan forms an important link in the great waterway system that reaches east to the Atlantic Ocean and south, through the Mississippi River, to the Gulf of Mexico.



Ships on Lake Michigan carry a great volume of freight and passengers. Ferries take many railroad cars across the lake so that trains need not travel around its southern tip.

Indians who lived on the shores of the lake called it *Michi-guma*, which means *big water*. *Michi-guma* became *Michigan* through popular use.

General Description

Location. Lake Michigan extends southward into Michigan, dividing that state into two peninsulas. Wisconsin and Illinois form its western border. A small part of Indiana touches the southern end of the lake.

Size. Lake Michigan is about 300 miles long and has an average width of 75 miles. It covers 22,400 square miles, almost the area of West Virginia.

Surface Features. Lake Michigan is 870 feet deep at some points. Its surface is 581 feet above sea level. It is about 21 feet lower than the surface of Lake Superior.

Green Bay is the largest arm of Lake Michigan. It lies at the northwestern corner of the lake. Grand Traverse and Little Traverse bays are on the east. Among the large rivers that enter Lake Michigan are the St. Joseph, the Fox, the Kalamazoo, the Grand, and the Menominee. The Chicago River flows out of Lake Michigan. It once flowed into the lake, but its course was changed by the Chicago Sanitary and Ship Canal (see CHICAGO SANITARY AND SHIP CANAL).

Commerce

Routes. Lake Michigan empties into Lake Huron through the Straits of Mackinac. The St. Lawrence Seaway connects it with the Atlantic Ocean. Lumber, grain, and mineral products from this region are shipped to all parts of the world. The Chicago Sanitary and Ship Canal and the Chicago and Illinois rivers connect the lake with the Mississippi River. Products from foreign countries may come by ship to Chicago.

Ports. Among the important Michigan ports on the lake are Petoskey, Traverse City, Manistee, Ludington, Muskegon, Grand Haven, Holland, Benton Harbor, St. Joseph, and Menominee. Wisconsin ports on Lake Michigan include Marinette, Sturgeon Bay, Green Bay, Manitowoc, Sheboygan, Milwaukee, Racine, and Kenosha. Michigan City and Gary, in Indiana, are Lake Michigan ports. Among the Illinois ports are Chicago, Calumet Harbor, and Waukegan. JOHN H. GARLAND

See also CHICAGO (Harbor and River Traffic; Water); GREAT LAKES; GREEN BAY; MICHIGAN (Climate).

LAKE MINNETONKA. See MINNESOTA (Rivers, Lakes, and Waterfalls).

LAKE NEAGH. See LOUGH NEAGH.

LAKE NEMI, *NAY mih*, lies in the Alban hills, about 15 miles southeast of Rome, Italy. It has an area of less than 1 square mile. Draining of the lake in the 1930's revealed well-preserved remains of Roman pleasure boats.

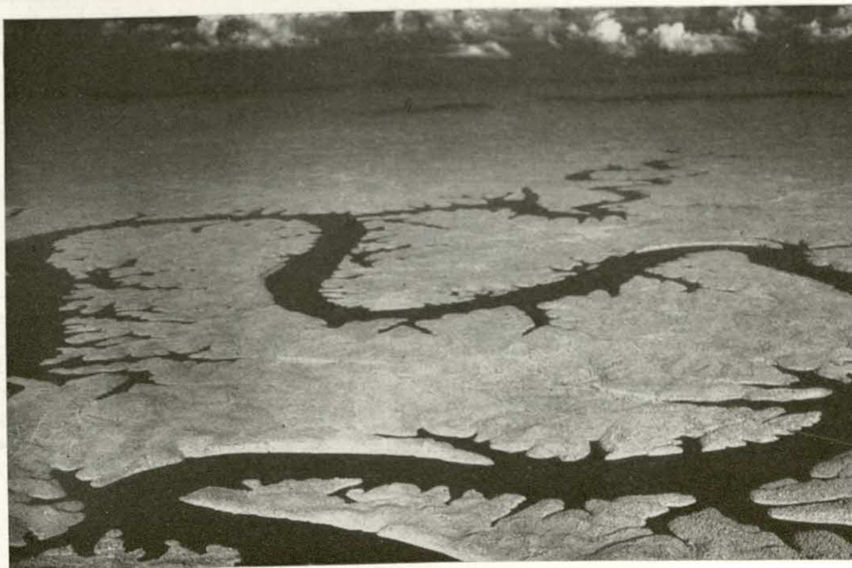
LAKE NICARAGUA lies in western Nicaragua, about 12 miles east of the Pacific Ocean and 70 miles west of the Caribbean Sea. For location, see NICARAGUA (color map). The lake covers 3,060 square miles and is 96 miles long and 39 miles wide. It varies from 50 to 200 feet in depth. Several large islands lie in the lake. Ometepe, the biggest has two volcanoes. The Tipitapa River connects Lake Nicaragua with Lake Managua on the north. LOYAL DURAND, JR.

LAKE NYASA, *nih AS uh*, is the southernmost of a chain of large fresh-water lakes in the Great Rift Valley of eastern Africa. It lies about 400 miles inland from the Indian Ocean. The lake flows into the Indian Ocean by way of the Shire and Zambezi rivers. Lake Nyasa is more than 350 miles long, with an area of about 11,000 square miles. Its surface is 1,550 feet above sea level, and its waters are more than 2,300 feet deep. HIBBERD V. B. KLINE, JR.

LAKE OF LUCERNE is the scene of some of the adventures of the legendary Swiss patriot, William Tell (see TELL, WILLIAM). It lies in central Switzerland. For location, see SWITZERLAND (color map). The lake's German name is *Vierwaldstätter See*, or *Lake of Four Forest Cantons*. The four wooded cantons (states) of Lucerne, Schwyz, Uri, and Unterwalden surround it. The scenic lake covers 44 square miles. It has the form of a rough cross, 24 miles long and 2 miles wide. The southeast arm extends into the high Alps. FRANKLIN C. ERICKSON

LAKE OF THE OZARKS was formed by the completion of the Bagnell Dam on the Osage River in 1931 (see BAGNELL DAM). Since then, the lake and its environs have become a popular resort and recreation center. The lake winds for about 130 miles among the Ozark Mountains of central Missouri. It has a 1,300-mile shore line, dotted with more than 300 resorts. For location, see MISSOURI (color map). C. T. PIHLBLAD

Gerald R. Massie



The Lake of the Ozarks is a man-made lake about 130 miles long. This aerial view photographed in infrared covers about 40 square miles. It shows the lake's winding path.

LAKE OF THE WOODS lies on the boundary between the United States and Canada. Some of the first trading posts in the West were located on the shores of this lake. Today, the lake is best known as a summer resort. It was named for the forests that cover its hilly shores and islands. The lake covers about 1,485 square miles, most of which lie in western Ontario. Two small bays, which make up about 60 square miles of the lake, are in Manitoba. The rest of the lake borders Minnesota. The northwest shore is the northernmost part of the continental United States, excluding Alaska. The lake is about 65 miles long, and from 10 to 50 miles wide. For location, see Minnesota (color map).

Lumbering is the chief occupation of the Lake of the Woods region. Fishing is important both as an industry and sport. Railways run along the northern and southern shores. In summer, tourist steamers sail up the lake.

The Lake of the Woods was an important factor in several boundary disputes between the United States and Great Britain. According to the treaty that ended the Revolutionary War, the boundary was to run from the northwest angle of the lake "on a due course west to the river Mississippi." The source of the Mississippi was later found to be a hundred miles farther south. The Convention of London fixed the present boundary in 1818.

Harold T. Hagg

LAKE OF THUN, *toon,* lies 1,830 feet above sea level in the Bernese Alps, a popular tourist region in west-central Switzerland. Interlaken is about two miles to the east. For location, see Switzerland (color map). The lake is formed by the Aare River, and receives the waters of the Simme River at its western end. The Lake of Thun is 10 miles long, averages about 2 miles in width, and is 712 feet deep at its deepest point. It covers 18 square miles.

LAKE OHRID. See Albania (Location and Surface Features).

LAKE OKEECHOBEE, *OH kee CHO bee,* is the largest lake in the southern United States. Okeechobee is a Seminole Indian word that means *plenty big water.* The lake lies in the Everglades of Florida, about 35 miles west of the Atlantic Coast (see Everglades). It covers about 730 square miles, and has an average depth of seven feet. Marshy jungles and cypress swamps line the shores of Okeechobee. A system of canals provides outlets to the Atlantic Ocean on the east and the Gulf of Mexico on the west.

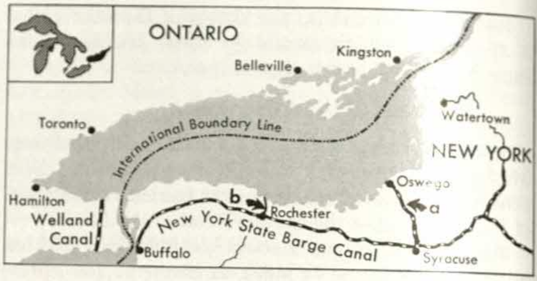
Kathryn Abbey Hanna

LAKE ONEGA, *oh NEHG uh,* is the largest lake in Europe except for Lake Ladoga. Lake Onega lies near the northwest corner of Russia. For location, see Russia (color map). It is part of the Stalin Canal system that connects the White and Baltic seas. The lake has an area of 3,820 square miles. It lies 125 feet above sea level. Lake Onega empties into Lake Ladoga, about 70 miles to the southwest, through the Svir River. It joins the Volga and northern Dvina rivers by a series of rivers and canals.

Theodore Shabad

LAKE ONEIDA, *oh NI dah,* is one of the links in the New York State Barge Canal system. The lake was named for the Oneida Indians, who once had a village on its shores. Lake Oneida lies in central New York, about 10 miles northeast of Syracuse. Its area is 79.8 square miles. It is about 25 miles wide, and 4 miles long. It empties into Lake Ontario. For location, see New York (color map).

William E. Young



Lake Ontario and Its Connecting Waterways are of great importance to commerce and trade. These waterways include, *a,* the Oswego Canal, and, *b,* the Genesee River.

LAKE ONTARIO is the smallest and most eastern of the five Great Lakes. It forms an important link in the St. Lawrence Seaway system. Although Lake Ontario is open to large ships throughout the year, it has less traffic than the other Great Lakes.

Lake Ontario lies between the province of Ontario and the northwestern part of New York. The lake is about 193 miles long and 53 miles wide. It covers an area of 7,540 square miles, more than six times the area of Rhode Island. The shore of the lake is about 480 miles around. Offshore, the lake is very deep, ranging from 500 to 778 feet. Its surface lies 246 feet above sea level, 326 feet lower than Lake Erie and 355 feet lower than Lake Superior. The great depth of the lake, together with its low-lying surface, means that two-thirds of its waters lie below sea level and are not touched by surface winds and currents. A steady top current moves across the lake from west to east at a rate of about a third of a mile an hour.

Lake Ontario does not freeze in winter, except along the shore, where the water is more shallow. The depth of its waters makes the surface of the lake cooler than the air above in summer, and warmer in winter. So the lake has a moderating effect on the climate of the surrounding area. The eastern outlet of Lake Ontario never has a really hot day, and the temperature of the southern shore is so moderate that fruit trees grow throughout this area on both sides of the border.

Lake Ontario empties into the Atlantic Ocean through the St. Lawrence River. The Niagara River and the Welland Canal connect it to Lake Erie on the southwest. It is connected with the Hudson River and New York City by the Erie Canal, the Genesee River, and the Oswego Canal. The rivers that empty into Lake Ontario include the Black, Genesee, Oswego, Trent, and Humber.

The lake has many good harbors. The chief lake ports include Rochester and Oswego, N.Y. Important Canadian ports are Cobourg, Toronto, Hamilton, and Kingston.

John H. Garland

See also Great Lakes; Welland Ship Canal.

LAKE PEIPUS, *PIE poos,* is a body of water on the eastern border of Estonia in Russia. For location, see Russia (color map). It is 93 miles long and covers 1,400 square miles. During World War II, the lake played an important part in the fighting during the siege of Leningrad. Both the Russians and the Germans crossed its frozen surface in winter.

Theodore Shabad

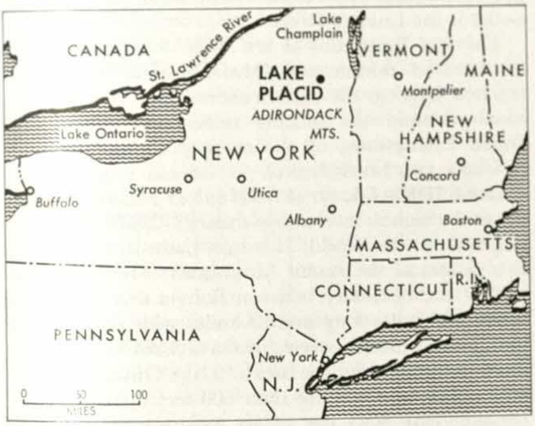
LAKE PLACID is one of the small, beautiful lakes in the Adirondack Mountains of Essex County, New York. Among the other well-known lakes nearby are the Saranac Lakes (see SARANAC LAKES). Glaciers formed the lakes in this region during the Ice Age. Lake Placid measures about 4 miles long and ½ mile wide, and covers 4.37 square miles.

The village of Lake Placid, long famous as a summer and winter resort, is near the southern end of the lake. It surrounds tiny Mirror Lake. The main summer activities of the area include boating, swimming, and other water sports; golf; hiking; mountain climbing; and tennis. In the winter, visitors enjoy bobsledding, hockey, ice skating, and skiing. The 1932 winter Olympics took place at Lake Placid. Abolitionist John Brown is buried there.

WILLIAM E. YOUNG

See also NEW YORK (Interesting Places to Visit; color picture).

Lake Placid Lies in New York's Adirondack Mountains.



LAKE POETS were William Wordsworth, Samuel Taylor Coleridge, and Robert Southey. They were so named by the *Edinburgh Review* because they lived in the Lake District of Cumberland and Westmoreland in England. Their only characteristic in common was a dislike of the stiff classicism which prevailed in the early 1800's. They worked to cultivate a simple and natural style of poetry. For some years the term was used scornfully, but it is now one of praise.

Wordsworth was a lover of nature and a pantheist. He wrote many poems about the common man and familiar subjects, trying to write in simple language. Coleridge was more dreamy and visionary, but he also had a keen, critical mind and produced much excellent Shakespearean criticism. Southey was the least talented of the three, and wrote long romantic tales in verse. The three men are sometimes spoken of as the "first generation" of romantic poets.

KNOX WILSON

See also ENGLISH LITERATURE (The Age of Romanticism); and separate articles in WORLD BOOK on each Lake Poet.

LAKE PONTCHARTRAIN, *PAHN cher TRAIN*, is a beautiful lake of brackish water in southeastern Louisiana. For location, see LOUISIANA (color map). The lake is 40 miles long and 25 miles wide, and covers 625 square miles. It is a major recreational center. The Industrial Canal connects Lake Pontchartrain with the Mississippi River to the south. The city of New Orleans stands on the ground between the lake and the river.

In 1956, the 31-mile-long Lake Pontchartrain Causeway, which spans the lake, opened. It is the world's longest over-water highway, with 24 miles over water. French colonists in Louisiana named Lake Pontchartrain for the Comte de Pontchartrain, minister of marine under Louis XIV.

FRED B. KNIFFEN

LAKE RUDOLF is a long, narrow lake near the equator in Africa. It covers 3,475 square miles in the northwest section of Kenya. The 185-mile-long lake also touches the southern border of Ethiopia. The region around the lake is barren. Lake Rudolf was discovered in 1888 by an Austrian expedition led by Count Pal Teleki. He named it after the crown prince of Austria.

LAKE SAINT CLAIR, together with the Saint Clair River on the north and the Detroit River on the south, forms a waterway connecting Lakes Huron and Erie. For location, see ONTARIO (color map). The lake's surface is about six feet lower than that of Lake Huron, and two feet higher than Lake Erie. Lake Saint Clair has been dredged so that large ships can cross it. Roughly circular in shape, the lake is 25 miles across the center and covers an area of 460 square miles. It forms part of the boundary between Michigan and Ontario.

LOYAL DURAND, JR.

LAKE SAINT JOHN. See QUEBEC (Rivers; color map).

LAKE SAINT LAWRENCE is the wide portion of the St. Lawrence River between Ogdensburg and Massena, N.Y. The lake is 28 miles long and between 1 and 4 miles wide. Lake Saint Lawrence was created in 1958 to drown out the rapids of the St. Lawrence River as an aid to navigation and to form a pool for the development of electricity. Its creation required flooding 38,000 acres.

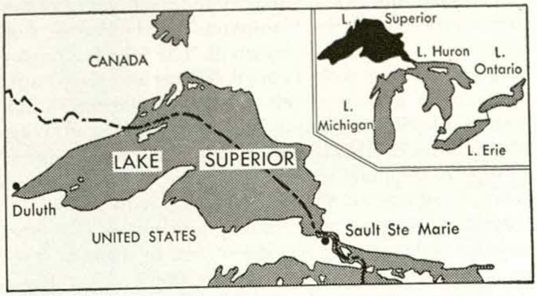
W. R. WILLOUGHBY

See also SAINT LAWRENCE SEAWAY (picture).

LAKE SCUTARI. See ALBANIA (Location).

LAKE SUPERIOR, one of the five Great Lakes of North America, is the largest body of fresh water in the world. It is also the deepest, the highest above sea level, and the farthest north and west of the Great Lakes (see GREAT LAKES). Lake Superior forms part of the great interior waterway system of the United States and Canada that extends from the Atlantic Ocean through the St. Lawrence Seaway, the Great Lakes, and the Mississippi River to the Gulf of Mexico (see SAINT LAWRENCE SEAWAY). Early French fur traders gave the name *Lac Supérieur*, French for *Upper Lake*, to the lake.

Location and Size. Lake Superior lies across the international border between the United States and



Lake Superior lies on the boundary between the United States and Canada. It is the farthest north of the Great Lakes, *inset*.

Canada. The Canadian province of Ontario is to the north and east of the lake. The states of Michigan and Wisconsin lie to the south of the lake, and the state of Minnesota is to the west.

Lake Superior covers 31,820 square miles, an area greater than the size of South Carolina. Its greatest length from east to west is 350 miles, and its greatest width is 160 miles. The lake lies about 602 feet above sea level, and is 1,333 feet deep at its deepest point.

Description. The coast line of Lake Superior is bold and rocky. In some places, especially along the northern shore of the lake, cliffs rise several hundred feet from the water's edge. Colorful sandstone walls, known as the Pictured Rocks, rise along some areas of the lake's shore in Michigan. The highway that follows the rocky Minnesota shore is lined with summer resorts, fishing villages, and state parks. Split Rock Lighthouse, a famous landmark, warns lake shipping from reefs in Beaver Bay along the Minnesota shore. Forests cover much of the land that borders the lake. About 200 rivers, most of them short, empty into Lake Superior. Many of them form waterfalls where they plunge over the high, rocky headlands. The largest river emptying into the lake is the St. Louis River, the extreme headwater of the St. Lawrence River. It drains into Superior's western end. The Keweenaw Peninsula, famous for its copper deposits, extends 75 miles into the lake in Upper Michigan. Many islands dot the surface of the lake. The largest are Michigan's Isle Royale and Ontario's St. Ignace and Michipicoten. Many small islands, named the Apostle Islands, lie off the northern shore of Wisconsin.

Commerce. Although Lake Superior does not freeze over in winter, shipping is restricted by winter storms and frozen harbors to the period from mid-April to December. Lake boats carry iron ore, taconite, wheat, lumber, copper, and other minerals to ports along the Great Lakes and farther east. The locks of the Soo Canals at Sault Ste. Marie carry ships around the rapids of the St. Marys River. This river connects Lakes Superior and Huron. The MacArthur Lock, built during World War II, is the deepest lock in the Soo Canals, and carries most of the traffic (see Soo Canals). The most important Lake Superior ports are Duluth, Two Harbors, Taconite Harbor, Silver Bay, and Grand Marais, all in Minnesota; Superior and Ashland, Wis.; Marquette, Mich.; and Port Arthur, Fort William, and Michipicoten Harbour, all in Ontario. John H. Garland

LAKE TAHOE, *TAH hoe,* is a beautiful, oval-shaped, glacial lake that lies in a mountain-ringed valley of the Sierra Nevada on the California-Nevada border. For location, see Nevada (color map). The lake is 23 miles long and 12 miles wide. It lies 6,228 feet above sea level, and has an average depth of about 1,500 feet. Lake Tahoe is 1,640 feet deep at its deepest point, and is one of the deepest lakes in the continental United States. Camps, homes, and resorts line its shores. The lake and the swift mountain streams that feed it attract many fishermen. Boating, water-skiing, and hunting are also popular. Lake Tahoe was discovered by John C. Frémont in 1844. It empties through the Truckee River into Pyramid Lake in Nevada. See also Nevada (color picture). George Shaftel

LAKE TANA, *TAH nah,* or **TSANA,** *TSAH nah,* lies in northern Ethiopia. For location, see Ethiopia (map). It serves as the main source of the Blue Nile, or Abbai River. The Blue Nile receives its color from the silt-free water of Lake Tana. Lying 6,000 feet above sea level, Lake Tana is 47 miles long and 44 miles wide, and covers 1,400 square miles.

LAKE TANGANYIKA, *TANG guhn YEE kuh,* in east-central Africa, is the world's longest fresh-water lake and the second deepest. Only Lake Baykal, in Russia, is deeper. The lake is bordered by Ruanda-Urundi and Tanganyika on the east and by the Republic of Congo and Rhodesia on the west. For location, see Africa (color map). The elevation of Lake Tanganyika changes, but it averages about 2,536 feet above sea level. Its bottom lies as much as 2,170 feet below sea level. The lake covers an area of about 12,700 square miles, and its shores, particularly in the west, are mountainous. Only one major river, the Ruzizi, drains into the lake. It flows from Lake Kivu to the north. Lake Tanganyika's outlet is the Lukuga River.

The first Europeans to see Lake Tanganyika were Sir Richard Burton and John Hanning Speke who reached Ujiji on the eastern shore in 1858. Henry M. Stanley found the missing missionary-explorer, Dr. David Livingstone, at the same point in 1871 (see Stanley and Livingstone). Hibberd V. B. Kline, Jr.

LAKE TITICACA, *TIT ih KAH kuh,* or *TEE tee KAH kah,* lies at the highest level above the sea (12,507 feet) of any large lake in the world. It is in a basin surrounded by two ranges of the Andes Mountains. The lake forms part of the boundary between Bolivia and Peru. It is about 110 miles long and 35 miles wide at its widest part. Lake Titicaca covers an area of 3,261 square miles, more than one third the area of Lake Ontario. A large part of the lake is more than 600 feet deep. The Rio Desaguadero flows out of its southwestern end and empties into Lake Poopó in Bolivia. Steamboats sail on Lake Titicaca. In 1955, William Mardorf, an American deep-sea diver, discovered the ruins of an ancient submerged city in the lake. Marguerite Uttley

LAKE TORRENS is a shallow body of salt water in South Australia. The lake lies 25 feet below sea level. It is 120 miles long and 40 miles wide. Lake Torrens has an area of 2,230 square miles.

LAKE TROUT. See Trout.

LAKE UNION. See Seattle.

LAKE URMIA, in northwestern Iran, is the country's largest lake. For location, see Iran (color map). It is salty and has no outlet. Its normal size is 2,300 square miles, but evaporation during the hot summer reduces Lake Urmia to about 1,500 square miles.

LAKE VAN is a salt-water lake in eastern Turkey. For location, see Turkey (color map). It covers about 2,000 miles and has no outlet. It is about 75 miles long and 50 miles wide. The ancient Armenian civilization grew up around the lake.

LAKE VÄNERN, *VAY nern,* **VÄNER,** *VAY ner,* or **VENER,** is the largest lake in Sweden and the third largest in Europe. It covers 2,149 square miles in southwestern Sweden. For location, see Sweden (color map). The western part of the lake is called Dalbo. A number of canals connect the Vänern with the Vättern, another large lake. The Vänern empties into the Skagerrak through the Göta River. John H. Wuorinen

LAKE VÄTTERN. See SWEDEN (Location).

LAKE VICTORIA, or, in Bantu, **VICTORIA NYANZA,** is the largest lake in Africa and the second largest fresh-water lake in the world. Its area of 26,828 square miles is exceeded only by that of Lake Superior. Lake Victoria lies in east-central Africa, partly in Kenya, partly in Tanganyika, and partly in Uganda. The equator crosses the northern part of the lake. For location, see AFRICA (color map).

The Nile River issues from the northern end of Lake Victoria at Jinja, Uganda. The Kagera River, which flows into the lake from the highlands of Ruanda-Urundi to the west, is sometimes taken as the source of the Nile. Owen Falls Dam, built across the Nile in 1954, has raised Lake Victoria's level about three feet to an elevation of 3,723 feet above sea level. The shallow water is a valuable source of fish.

The English explorer John Hanning Speke discovered Lake Victoria in 1858, and named it in honor of Queen Victoria of Great Britain. HIBBERD V. B. KLINE, JR.

LAKE WASHINGTON. See SEATTLE.

LAKE WINDERMERE. See WINDERMERE LAKE.

LAKE WINNEBAGO, the largest lake in Wisconsin, covers 215 square miles in the east-central part of the state. It is about 30 miles long, and 5 to 10 miles wide. The Fox River enters the lake on the west at Oshkosh, and leaves at the northwest end at Neenah and Menasha. Fond du Lac lies along the southern shore.

LAKE WINNIPEG, in south-central Manitoba, is the third largest lake lying entirely within Canada. Only Great Bear Lake and Great Slave Lake in the Northwest Territories are larger. Lake Winnipeg lies about 35 miles north of the city of Winnipeg. It covers an area of 9,398 square miles, and is known as one of the "Great Lakes of Manitoba" (see MANITOBA [Rivers and Lakes]). The lake is 260 miles long, and from 20 to 60 miles wide. It lies 710 feet above sea level, and does not exceed 70 feet in depth. In ancient times, Lake Winnipeg and its two large neighbors—Lakes Winnipegosis and Manitoba—formed parts of large, shallow Lake Agassiz, created by glaciers during the Ice Age (see LAKE AGASSIZ). Large islands in Lake Winnipeg include Reindeer Island and Big Island. The lake's fisheries are the most important in Manitoba. The largest catches are of pickerel, whitefish, and sauger.

Lake Winnipeg is a storage reservoir for the Saskatchewan-Nelson river system, draining an area of 370,000 square miles. W. L. MORTON

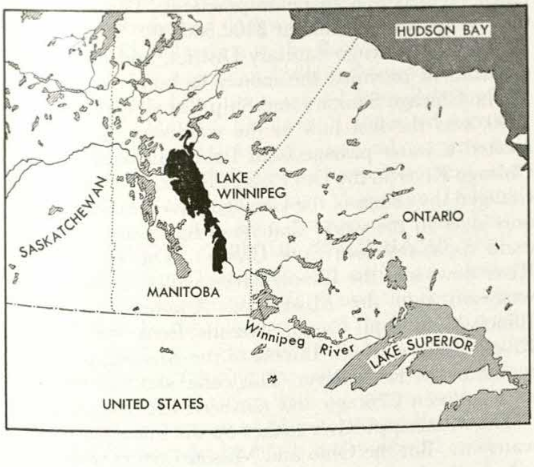
LAKE WINNIPEGOSIS, *WIN ih peg OH sis*, lies in the lowlands of southwestern Manitoba. It covers 2,086 square miles, and is about 120 miles long, 20 miles wide, and 38 feet deep. The lake drains into Lake Manitoba by way of the Waterhen River. For location, see MANITOBA (color map). It formed part of Lake Agassiz during the Ice Age (see LAKE AGASSIZ). D. F. PUTNAM

LAKE WINNIPESAUKEE, *WIN uh puh SAW kee*, in east-central New Hampshire attracts many summer visitors. The lake is about 22 miles long and from 1 to 10 miles wide. It has 365 islands. For location, see NEW HAMPSHIRE (color map).

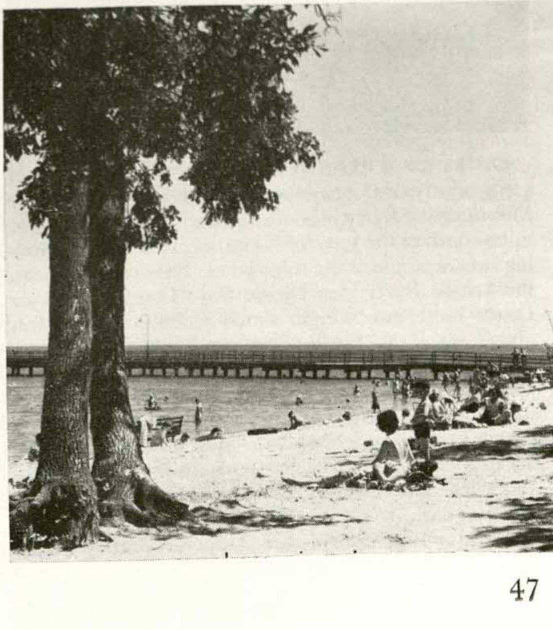
LAKE XOCHIMILCO, *so chee MEAL koh*, a swamplike lake just southeast of Mexico City, Mexico, is noted for its so-called "floating gardens." By the time the Spaniards conquered the region in 1521, the Indians had created five shallow lakes out of a larger one by building dikes. They heaped soft mud onto interwoven twigs, and made seed beds for flowers and vegetables. These "floating gardens" gradually increased in size and became anchored by the interlacing roots of the plants. Every year, thousands of tourists travel through the canals that separate these man-made islands. JOHN A. CROW

See also FLOWER (color picture, Flowers in Festivals and Customs).

LAKEHURST, N.J. (pop. 2,780; alt. 66 ft.), is the home of a famous U.S. Naval Air Station. Some of the first experiments with *dirigibles*, or lighter-than-air ships, were made here. Lakehurst lies about 30 miles southeast of Trenton. The *Shenandoah*, the first American-built dirigible, made its first flight from Lakehurst in 1923. Ten years later the dirigible *Akron* left the Naval



National Film Board



The Beach on Lake Winnipeg is a popular spot on warm summer days. Lake Winnipeg is 260 miles long. It is the third largest lake entirely within the borders of Canada.

Air Station on a flight but fell into the sea off Barnegat. On May 6, 1937, fire destroyed the airship *Hindenburg* as it approached the station for a landing. A total of 36 persons were killed.

Richard P. McCormick

LAKEHURST NAVAL AIR STATION, N.J., is the center of United States naval airship and helicopter operations. It covers 7,350 acres, and lies 50 miles east of Philadelphia. The station occupies land that had been used as an ammunition proving ground for the Russian government. The navy took over the land in 1921 and set up a naval station. In 1937, the famous German dirigible *Hindenburg* burst into flames and crashed while coming in to land. During World War II, the Lakehurst Naval Air Station provided airships for convoy duty.

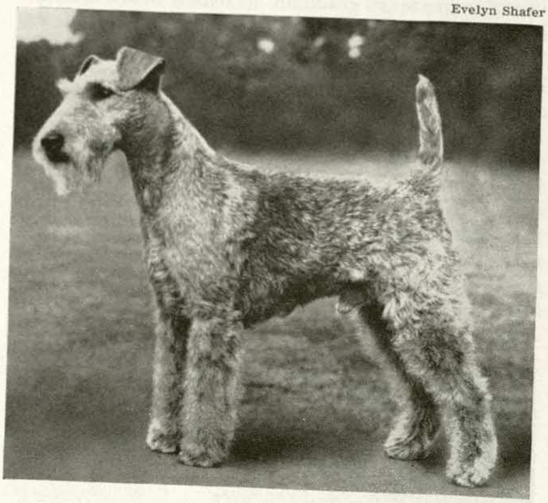
John H. Thompson

LAKELAND TERRIER is one of the bravest dogs that ever dug a fox out of the ground. It comes from the Lake District of northern England. It was first raised to hunt marauding foxes and to protect sheep. The lakeland is now a frisky companion, full of play and mischief. It has a narrow body and a long head, with a beard around its chin. It may be black or blue with tan markings, red, or mustard color. The lakeland weighs from 15 to 17 pounds.

Josephine Z. Rine

The Lakeland Terrier was popular in England during the early 1800's. It was used for fox-hunting.

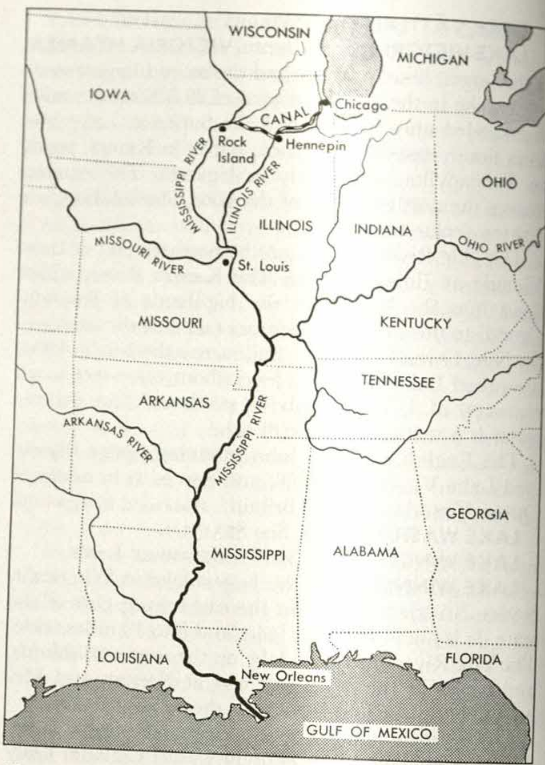
Evelyn Shafer



LAKES OF KILLARNEY are three famous lakes of great beauty in County Kerry, Ireland. They lie in the Mountains of Kerry in southwestern Ireland, about two miles south of the town of Killarney. A beautiful winding stream connects the three lakes. They drain through the Laune River into Dingle Bay. Lough Leane, or Lower Lake, covers eight square miles, and is 66 feet above sea level. Lough Torc, or Middle Lake, also called Muckross Lake, covers about one square mile. The ruins of Muckross Abbey, built in the 1400's, stand on a peninsula that separates Lough Torc from Lough Leane. Upper Lake, the most scenic of the three, lies in a deep valley 70 feet above sea level, and covers 430 acres. The area around the lakes is preserved as a national park.

T. W. Freeman

See also Ireland (picture, Upper Killarney Lake).



The Lakes-to-Gulf Waterway Opened in June, 1933.

LAKES-TO-GULF WATERWAY is a great inland waterway system that extends southward across the United States from Lake Michigan to the Gulf of Mexico. It also connects with the Saint Lawrence Seaway through the Great Lakes. The waterway opened to ship and barge traffic in June, 1933. To complete the water passage, engineers had to construct canals to connect other rivers to the Mississippi River. They also had to dredge parts of the Mississippi to make it deeper. New methods of river improvement, canal building, and barge construction made it practical. The Lakes-to-Gulf Waterway cost about $102,500,000. The state of Illinois, the Chicago Sanitary District, and the federal government provided the money to build the project.

The Chicago Sanitary and Ship Canal, completed in 1900, was the first link in the waterway. This canal created a water passage from Lake Michigan via the Chicago River to the Des Plaines River. The canal also changed the course of the Chicago River, making it the only river in the world that flows backward (see Chicago Sanitary and Ship Canal). The Des Plaines River flows into the Illinois River, which drains southwestward into the Mississippi. Another canal, the Illinois-Mississippi Canal, extends from the Illinois River, across northern Illinois to the Mississippi at the mouth of the Rock River. This canal shortens the passage between Chicago and northern Mississippi ports.

The Mississippi River makes up the main part of the waterway. But the Ohio and Missouri rivers with their tributaries also feed into the waterway. The Ohio River and its branches have 3,335 miles of navigable waterways, and the Missouri and its branches have 2,562 miles. The entire Ohio, Missouri, and Mississippi river systems contain 12,475 miles of navigable channels.

The largest number of river barges in the United States use the Mississippi-Ohio river system. Cargoes of wheat, corn, coal, petroleum, iron, and steel move on barges pushed by tugs. The barges are limited to about 250 feet in length and 50 feet in width by the size of the locks on the waterways. At times as many as 18 barges are fastened and pushed together. E. Willard Miller

See also Inland Waterway; Saint Lawrence Seaway.

LAKEWOOD, Ohio (pop. 66,154; alt. 710 ft.), is one of Cleveland's largest suburbs. It lies on Lake Erie, just west of Ohio's largest city (see Ohio [map]). Although chiefly a residential city, Lakewood has a number of manufacturing plants which stand in the southeast section of the city. Goods manufactured in the city include bolts and screws, carbon products, castings, conveying equipment, and dies and tools. Lakewood, settled as East Rockport, was renamed in 1889. It was incorporated as a city in 1911, and has a mayor-council form of government. James H. Rodabaugh

LAKMÉ. See Opera (Some of the Famous Operas).

LALO, *lah LOH,* **ÉDOUARD** (1823-1892), a French composer of Spanish descent, gained fame for his violin concerto, *Symphonie Espagnole* (1873). His other works include the opera, *The King of Ys* (1888) and the ballet, *Namouna* (1882), which he later arranged into two orchestral suites. Lalo's music is considered characteristic of French culture at its best. He was born at Lille, France. His full name was Victor Antoine Édouard Lalo. In 1839, he entered the Paris Conservatory, where he studied violin. Theodore M. Finney

LAMAISTS, *LAH muh ists,* are believers in a religion that flourishes in Tibet, Mongolia, and parts of China proper. About A.D. 650, traditional beliefs and the influence of the Buddhists combined to form Lamaism. Certain Brahmanic celebrations and the worship of some Brahmanic gods show the influence of Hinduism on the religion. The highest priest of Lamaism is the Lama. He is believed to be a reincarnation of a *bodhisattva*, or one who may at some future time become a Buddha. George Noel Mayhew

See also Buddhists; Dalai Lama; Mongolia (picture); Panchen Lama; Tibet (History).

LAMANITES, according to the *Book of Mormon*, were forefathers of the American Indians. Mormons believe that the prophet Lehi led a colony from Palestine to America about 600 B.C. Lehi's son Laman led a group that rebelled, denied their religion, and became nomads. They later killed all who opposed them and became the ancestors of today's American Indians. They took their name from Laman. See also Lehi.

LAMAR, LUCIUS QUINTUS CINCINNATUS (1825-1893), a Mississippi statesman and politician, worked for good feeling between the North and the South after the Civil War. In 1861, he had urged the South to withdraw from the Union. He held Confederate diplomatic and military posts during the war. But, in 1874, he attracted national attention with his tribute to the late Senator Charles Sumner of Massachusetts. Southerners had hated Sumner for his harsh policy toward them.

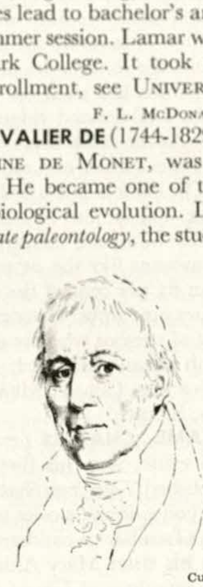
Lamar's postwar career included service in the U.S. House of Representatives from 1873 to 1877, and in the U.S. Senate from 1877 to 1885. He served as Secretary of the Interior from 1885 to 1888, and then was appointed Associate Justice of the U.S. Supreme Court. Lamar was born in Louisville, Ga., and was graduated from Emory College. Richard N. Current

LAMAR, MIRABEAU BUONAPARTE (1798-1859), served as the second elected president of the Texas Republic from 1838 to 1841. He settled in Texas in 1835, and the next year fought in the revolution against Mexico. He served as vice-president of the new republic from 1836 to 1838. In 1838, Texans elected him president to succeed Sam Houston. His three-year term featured stern treatment of the Indians and plans for public education throughout the new republic. Lamar was born in Louisville, Ga. Wayne Gard

LAMAR STATE COLLEGE OF TECHNOLOGY is a state-controlled coeducational school in Beaumont, Tex. It has schools of arts and sciences, engineering, business, education, and fine arts. Courses lead to bachelor's and master's degrees. There is a summer session. Lamar was founded in 1923 as South Park College. It took its present name in 1951. For enrollment, see Universities (table). F. L. McDonald

LAMARCK, *lah MARK,* **CHEVALIER DE** (1744-1829), Jean Baptiste Pierre Antoine de Monet, was a French biologist and botanist. He became one of the first to propose a theory of biological evolution. Lamarck was a founder of *invertebrate paleontology*, the study of fossils of animals without backbones.

From his work in botany, Lamarck concluded that plants and animals change their forms to adapt to their environment, and that these changes are passed along to their offspring. His studies of plant and animal life greatly aided Charles R. Darwin in his development of the theory of evolution.


Culver

Chevalier de Lamarck

In 1788, Lamarck became conservator of the royal herbarium. He transferred his interest from the study of plants to that of animals. In 1793 he was appointed a professor of zoology at the Museum of Natural History in Paris. While teaching, he developed the system now used for classifying invertebrate animals.

Lamarck was the first scientist to try to forecast the weather. He published an annual meteorological report from 1799 to 1810. It is said that he was responsible for the names of the various cloud types: *cirrus*, *stratus*, *cumulus*, and *nimbus*.

Lamarck was born on Aug. 1, 1744, at Bazentin, Picardy, and studied briefly for the priesthood. He served as an army officer during the Seven Years' War. He started the study of medicine in 1768, but at the age of 24 began studying under the noted botanist Bernard de Jussieu. His views on evolution influenced thought in the 1800's. In his later years he was completely blind, but he continued his work, with the help of others. Rogers McVaugh

See also Darwin (Charles Robert); Evolution (Early Theories).

LAMARTINE, *LAM ur TEEN,* **ALPHONSE MARIE LOUIS DE PRAT DE** (1790-1869), was a French writer, historian, and statesman. His greatest success was the tenderly pathetic verse of *Poetic Meditations* (1820). This widely-read book of poems influenced the development of romanticism (see ROMANTICISM). He also wrote several histories, but these have little value as history.

Lamartine served in the French diplomatic corps at posts in Italy from 1820 to 1830. Then he entered politics and was elected to parliament in 1833. After the revolution of 1848, he served as minister of foreign affairs and, briefly, as head of the government. Lamartine was born in Mâcon, France.

F. J. CROWLEY

LAMB is the flesh of young sheep, also called lambs. It differs from mutton, the flesh of older sheep, in both tenderness and flavor. While there is no definite age at which lamb becomes mutton, the meat industry makes the test of lamb by the appearance of the "break joint" where the forefeet are taken off the slaughtered animal. In lambs less than one year old, the break joint has eight well-defined ridges that are smooth, moist, and red. As the lamb nears one year of age, the break joint becomes harder and more porous, and is less ridged.

The color of lamb flesh ranges from light pink to dark pink. The fat may be creamy white or light pink. People of the European countries prefer mutton to lamb. But Americans like the more delicate flavor of lamb. More than 85 per cent of the sheep marketed in the United States are lambs. Doctors often recommend lamb in the diet of persons who are recovering from illness, because lamb is easily digested.

JAMES A. BEALL

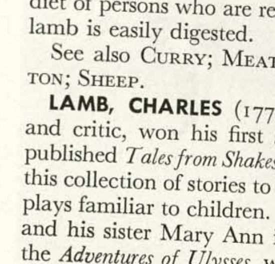
See also CURRY; MEAT AND MEAT CARVING; MUTTON; SHEEP.

LAMB, CHARLES (1775-1834), an English essayist and critic, won his first success as a writer when he published *Tales from Shakespeare* in 1807. Lamb designed this collection of stories to make William Shakespeare's plays familiar to children. He interpreted the tragedies, and his sister Mary Ann interpreted the comedies. In the *Adventures of Ulysses,* which appeared the following year, Lamb gave his own simplified version for children of the Greek epic poem, *The Odyssey.* From 1820 to 1823, Lamb wrote regularly for the *London Magazine.* His first series of *Essays of Elia* (1823) had appeared originally in that publication.

These essays rank among the finest of their kind in the English language. Largely autobiographical, they deal with everyday happenings in the life of Lamb. They show his gentle humor, tender sympathy, and rare devotion to his family and friends. ELIA, the pen name which Lamb used, was really the name of an Italian clerk who worked with him.

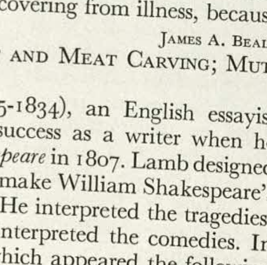
Charles Lamb

Brown Bros.



Mary Lamb

Culver



While at school, Lamb met Samuel Taylor Coleridge, who became his greatest friend. Lamb's first published writings, four sonnets, appeared in Coleridge's *Poems on Various Subjects* (1796).

In 1798, Lamb published *The Tale of Rosamund Gray* and, with his friend Charles Lloyd, *Blank Verse.* In this volume, Lamb's best-known poem, "The Old Familiar Faces," appears. The notes that Lamb wrote in his *Specimens of English Dramatic Poets Who Lived About the Time of Shakespeare* (1808) laid the foundation for his reputation as an outstanding critic. This work popularized the plays of the lesser dramatists who wrote during the reigns of Elizabeth I and James I.

From 1798 to 1801, Lamb also added to his small income by writing for three newspapers. In 1802, he published *John Woodvil,* a five-act tragedy, but it proved unsuccessful. His next attempt at drama, *Mr. H.,* also met with failure.

In 1825, Lamb retired on pension from his job, but idleness seemed to hamper rather than develop his genius. In his last years, he produced little of importance, with the exception of *Last Essays of Elia* (1833).

Lamb was born in London, and went to school at Christ's Hospital. His parents were poor, and he left school to go to work when he was 14 years old. For a short time, he served as clerk in the South Sea House. Then in 1792, he joined the East India Company as a clerk. During his 33 years in this humdrum job, Lamb developed as a noted writer, proof that genius can grow in the most ordinary surroundings.

His sister Mary Ann suffered periods of insanity during her lifetime, and Lamb devoted his own life to her care. For long periods she stayed well enough to help her brother with his writing. Lamb was deeply devoted to his sister, and he was never married.

G. E. BENTLEY

Mary Ann Lamb (1764-1847), the sister of Charles Lamb, collaborated with her brother in writing three books for children. They were *Tales from Shakespeare* (1807); *Mrs. Leicester's School* (1809), a collection of 10 stories, of which only three were the work of Charles; and *Poetry for Children* (1809).

In 1796, while the brother and sister still lived at home, a tragedy occurred which darkened the entire life of Mary Ann and Charles. Mary Ann, in a fit of temporary insanity, stabbed their mother with a knife, and mortally wounded her. The court gave Mary into the custody of her brother, and she lived with him most of the time until his death in 1834. Mary was born in London.

JEAN THOMSON

LAMB, WILLIS EUGENE, JR. (1913-), an American nuclear physicist, shared the 1955 Nobel prize with Polykarp Kusch. Working independently, they discovered slight deviations from the Dirac theory on the behavior of the hydrogen atom (see DIRAC, PAUL ADRIEN MAURICE). Lamb was cited for his discoveries of the hyperfine structure of the hydrogen spectrum. Lamb was born in Los Angeles. He has taught at the University of California, and Harvard, Stanford, and Oxford universities.

R. T. ELLICKSON

See also NOBEL PRIZES (picture).

LAMBERT PROJECTION. See Map (Conic Projections).

LAMBETH CONFERENCES are meetings of bishops of the Anglican Communion held in London about once every ten years. They are held to discuss church doctrine and policy. The first conference met in 1867.

LAMBETH PALACE. See London (Lambeth and Southwark).

LAMB'S-QUARTERS is a tall weedy herb related to beets and spinach. Lamb's-quarters grows in Europe, Asia, and North America. It is sometimes 10 feet tall and bears clusters of small greenish flowers. People often gather its leaves to eat as greens. Lamb's-quarters is also called *pigweed* and *goosefoot.*

Lamb's-quarters is closely related to a plant in the southern United States called *wormseed.*

Scientific Classification. Lamb's-quarters belongs to the family *Chenopodiaceae.* It is genus *Chenopodium,* species *album.* Wormseed is *C. ambrosioides,* variety *anthelminticum.*
Walter C. Muenscher

Lamb's-Quarters is a tall herb with dense clusters of tiny green flowers. It grows in many parts of the world.

J. Horace McFarland

LAMBUTH COLLEGE is a coeducational liberal arts school in Jackson, Tenn. It is operated by the Memphis Conference of the Methodist Church. Courses lead to A.B. and B.S. degrees. Lambuth has a three-year degree program for students wishing to enter professional schools for specialized training. Lambuth College was founded in 1843. For enrollment, see Universities and Colleges (table).
L. L. Gobbel

LAME DUCK AMENDMENT is the name sometimes given to Amendment 20 to the United States Constitution, passed in 1933. The amendment provides that the terms of Senators and Representatives begin on January 3 following their election in November, and that a new session of Congress would open on this day. This moved the date of a candidate's taking office closer to the date of his election. Under the old law, newly elected members of Congress did not attend a regular session until the following December, 13 months after their election. *Lame ducks,* or Congressmen who were not reelected, attended the short session of Congress which began in December after their defeat, and lasted until their terms ended the following March.

LAMENTATIONS, *LAM un TAY shunz,* is one of the poetical books of the Old Testament, or Hebrew Bible. According to tradition, the prophet Jeremiah wrote it. Four of the book's five chapters contain *elegies,* or songs of mourning, on the destruction of Jerusalem in 586 B.C. (see Jews [Israel and Judah]). Jeremiah had foretold the event and lived to witness it himself. The fifth chapter is a plea to the Lord for forgiveness and restoration.

The songs, called *kinot,* describe the corruption of the leaders and the people, and their sufferings after the conquest. They also contain moving prayers to God. The first four kinot are written in an alphabetical acrostic (see Acrostic). Each stanza begins with a letter of the Hebrew alphabet in its proper order.
Robert Gordis

LAMINATED GLASS. See Glass (Specialty Glasses).

LAMINATING is a process of permanently bonding together two or more pieces of wood with glues, pressure, and sometimes heat. In laminating, alternate layers of wood are placed with their grains running at right angles to each other. This gives the wood added strength. Lamination may also be used to improve the appearance of wood products. A thin veneer of costly beautiful wood can be bonded on top of a piece of cheap, unattractive wood. Plywood is the most common type of laminated wood (see Plywood). Paper, metal, and plastics are other materials that may be bonded to wood by lamination.
Peter Terzick

See also Plastics (Laminating).

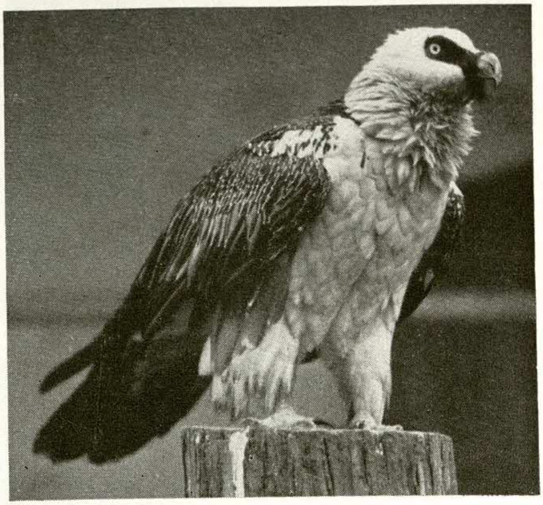
LAMINATION. See Geology (Some Terms [Bed]).

LAMMERGEIER, *LAM ur GYE ur,* is one of the largest vultures of the mountain regions of Africa, Asia, and Europe. Its body is from 42 to 46 inches long and its wingspread is between 9 and 10 feet. It feeds on dead animals. But it is also said to capture and kill live animals, especially helpless young ones. The lammergeier is a dull-colored bird. Its feathers are largely grayish-black, white, and light brown.

Scientific Classification. The lammergeier belongs to the family *Accipitridae.* It is genus *Gypaëtus,* species *barbatus,* variety *aureus.*
Olin Sewall Pettingill, Jr.

The Lammergeier is also called the "bearded vulture," because it has a tuft of bristly black feathers that hangs down like a beard from the base of its bill.

New York Zoological Society



LAMP

Lightolier

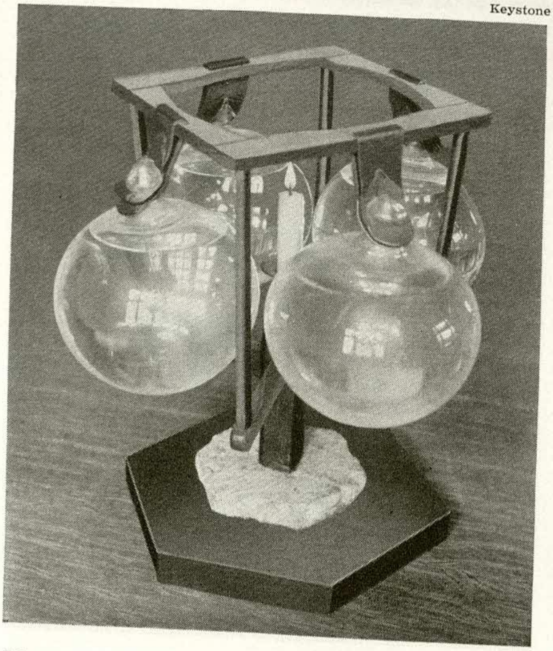
Contemporary Electric Lamps and lamp shades follow simple straight lines and provide a maximum of soft, glarefree light.

LAMP is any device that gives off light. It may also be a device that furnishes heat for special purposes, such as treating some illnesses. The most common lamps are electric lights. But, many persons still keep candles, kerosene lanterns, and other old forms of the lamp in their homes. They may use them for decorative effects, or to provide light in emergency situations, such as during power failure. In some countries and in rural areas, candles, lanterns, and oil lamps are still a main form of lighting.

Kinds of Lamps. The most widely used electric lamp is the incandescent light bulb. In these lamps, an electric current heats a tiny filament made of tungsten until it becomes *incandescent*, or glows, giving off light (see Electric Light). Manufacturers make thousands of kinds and sizes of incandescent electric lights. In the modern automobile, the headlights not only produce light but also control the rays that are given off. The backs of these lamps are shaped to reflect the light in straight lines. A glass lens then makes the rays slant down to illuminate the roadway ahead of the automobile and to reduce glare.

The Cobbler's Lamp Used in the Middle Ages had four water-filled globes mounted on a square stand. The rays of the candle were diffused when they passed through the globes.

Keystone



Other kinds of electric lamps include mercury-vapor lamps, fluorescent lights, and arc lights. In the *mercury-vapor lamp*, electric current makes mercury vapor give off ultraviolet rays. People use these lamps to obtain sun tans, to treat physical ailments, or as sterilizers to kill bacteria (see Sun Lamp). In the *fluorescent lamp*, an electric current makes mercury vapor give off rays that cause a coating in the lamp to glow with visible light (see Fluorescent Lamp). In the *arc lamp*, light is produced by an electric arc leaping across a space between two electrodes (see Arc Light). Some types of electric lamps are designed to produce *polarized light*, or light with rays that all vibrate in the same direction (see Polarized Light).

History. Prehistoric man stumbled onto the principle of the lamp when he lighted rushes set inside animal skulls filled with melted fat. He did not know it, but these rushes burned for a long time because they drew up melted fat through capillary action (see Capillarity). The ancient Egyptians improved on the crude lamps of prehistoric man. They used wicks made of cotton set inside hollow stones filled with grease. The Greeks and Romans shaped lamps from terra cotta and bronze, and burned olive oil in them. Except for the addition of reflectors to diffuse or concentrate the light, few improvements in lamps occurred until the 1700's.

In the 1700's, a Swiss chemist, Aimé Argand, invented a new type of wick. Instead of being flat, it was tube-shaped and set between two metal cylinders. This wick produced a circular flame. Lamps that used this type of wick became known as *Argand* lamps. Later, one of Argand's assistants made another big improvement when he discovered that flame burns more brightly and with less smoke when under glass. This led to the invention of the lamp chimney. During this period, whale oil served as one of the main fuels for lamps.

In the late 1700's and early 1800's, scientists learned how to use gas as a fuel, and the gas lamp became a main source of lighting. The gas lamp was improved in the mid-1800's with the development of a *gas mantle* that became incandescent when heated by a gas flame. During the 1800's, kerosene also replaced oil as the fuel for oil lamps (see Kerosene).

Thomas A. Edison invented the electric light in 1879. Since that time, the electric lamp has become the most important form of artificial lighting. The world's largest electric lamp was built in 1954 to commemorate the 75th anniversary of Edison's invention. This lamp, on display in Cleveland, stands 42 inches high and uses 75,000 watts of electricity. It weighs 50 pounds and produces as much light as 2,875 60-watt light bulbs can produce.

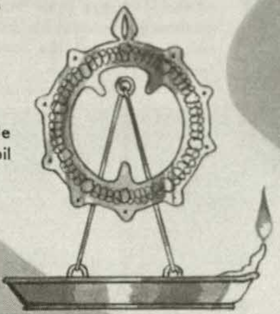
Karl A. Staley

See also Archaeology (picture); Fire (Light); Flame; Flashbulb; Light.

HISTORY OF THE LAMP

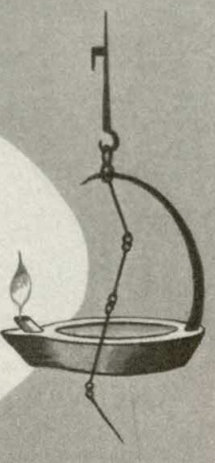
One of the First Lamps was a wick dipped in grease. The holder was made of stone.

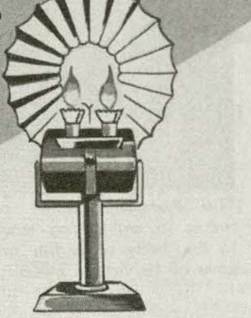
Ancient Greek Lamp was made of terra cotta or bronze. Olive oil was poured in the top for fuel.

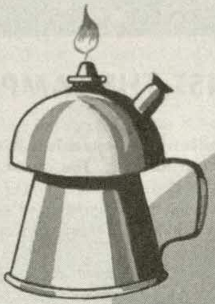

Decorated Lamps became fashionable. A lamp was a symbol of wisdom in the sense that "the light of knowledge overcomes ignorance."

The Candle was a great improvement over fat and oil fuels. Candles were expensive and could only be afforded by the rich.

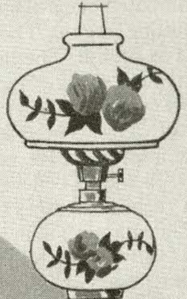
The Pioneer "Betty" Lamp burned fish oil. The crescent-shaped arm fitted into loops of the linked chain. This made it possible to raise or lower the lamp.

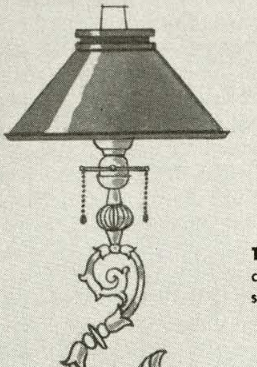


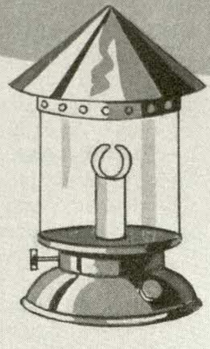

Student Lamp burned lard oil and had a highly polished reflector. Noah Webster used this type of lamp when working on his dictionary.


The "Petticoat" Lamp burned whale oil and was made of tin.

The Discovery of Kerosene and the invention of a glass chimney made possible a greatly improved lamp.


The Decorated Kerosene Lamp was widely used in the late 1800's.


The Gaslight Lamp was the last improvement before electricity became the popular form of lighting.

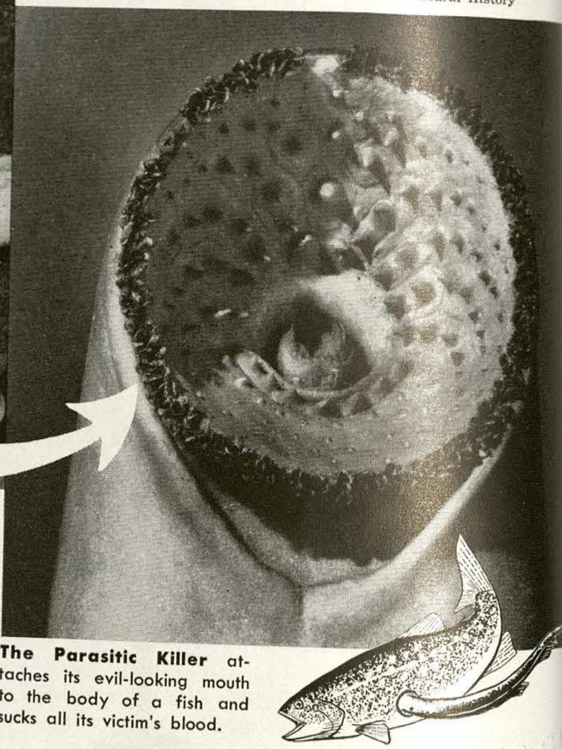

Today's Gas Pressure Lamp gives a light that rivals the electric bulb. It is still widely used in isolated rural areas.

The Weirs are strings of electrodes placed across streams where the lampreys spawn. The electrified field turns many of the lampreys aside into traps. Those that try to push on through the weirs are paralyzed by the current. Poisons also help to kill the lamprey larvae without harming food fish in the lakes.

Woodrow Jarvis; American Museum of Natural History

THE WAR AGAINST THE LAMPREY

A Joint United States-Canadian Conservation Program carries on the fight against the sea lamprey. This eel-like creature destroys trout and other food fish in the Great Lakes. Biologists working on the program, *above*, weigh and measure lampreys trapped by electrified *weirs*, or fences, *above right*.



The Parasitic Killer attaches its evil-looking mouth to the body of a fish and sucks all its victim's blood.

LAMP WORKING. See GLASS (How Glass Is Shaped).

LAMPANG, *LAHM PAHNG* (pop. 25,000; alt. 900 ft.), is a city in Thailand, about 45 miles southeast of Chiang Mai. See THAILAND (color map). It is a lumber center in a heavily forested area where many teak trees grow. Industries include cotton mills and tanneries. Copper, iron, and lead come from nearby mines.

LAMPBLACK is a fine carbon or soot made from coal or wood tar, pitch, petroleum, resin, or other materials. These are partly burned in brick furnaces or cast-iron vessels. The dense smoke that results passes through a chimney into the settling chambers where the soot is left. Lampblack contains oily matter. Crude lampblack is used chiefly in the manufacture of wax pencils, paints, rubber, and printer's ink. For manufacturing India ink, purified soot is better.

THOMAS MUNRO

See also CARBON; INK; SOOT.

LAMPMAN, ARCHIBALD (1861-1899), one of Canada's leading poets, published three volumes of poetry: *Among the Millet* (1888), *Lyrics of Earth* (1893), and *Alcyone* (1899). Lampman felt that there is a universal harmony in nature which human society has failed to achieve. His work is noted for the accuracy of its nature descriptions and the skill of its craftsmanship. Lampman was born in Morpeth, Ont., and studied at Trinity College, Toronto.

DESMOND PACEY

LAMPREY, *LAM prih*, is a water animal with a long slender body like that of an eel. But the eel is a true fish with hard bones, and separate bones that make up its backbone. The lamprey is not a true fish. It has a spinal column composed of cartilage, and a *notochord*, a primitive supporting organ. The lamprey does not have paired fins as do fish. The lamprey also lacks jaws. Its mouth is a round sucking organ. With this sucking disc, the lamprey can climb even vertical surfaces, such as the wet faces of dams. These features place the lamprey among the most primitive vertebrates, or animals with backbones. Biologists believe the lamprey has changed little from prehistoric times (see PREHISTORIC ANIMAL).

Body. The lamprey's skin is smooth, shiny, and scaleless. *Brook lampreys*, which live in small streams throughout temperate parts of Europe, Asia, and North America, grow about 8 inches long. Larger *species*, or kinds, live in rivers and lakes. The *sea lampreys* which may grow as much as 3 feet long, live in the North Atlantic and North Pacific oceans. All lampreys are dull colored, ranging from light tan to mottled brown or bluish black. They do not have true bony teeth. Their teeth are horny developments that grow from the inner surface of the mouth.

Habits. Lampreys spawn in clear water streams. The male and female dig a shallow nest in the gravel or pebbles of the stream bottom. The female deposits the eggs in the nest. The adults die after spawning. Young, or *larval*, lampreys are called *ammocoetes*. They are blind and toothless, and look like worms. They live in the sand and mud of the stream bottom for several years. Then they change into the adult form, with eyes and teeth.

Parasitic lampreys feed by attaching themselves to fishes, scraping a hole through the skin, and sucking out blood and other body fluids. The adults of the *nonparasitic* lampreys do not eat. Their digestive organs degenerate, and they live only until the spawning season. Then they spawn and die.

Destructiveness. Large sea lampreys rank as the most destructive to fishes. As adults, they descend to the sea and prey on large fishes. But some sea lampreys that spawned in streams flowing into Lake Ontario once entered the upper Great Lakes through the Welland Canal. Later generations of these lampreys no longer descend to the sea, but prey on lake trout, whitefish, and other large lake fishes. They have killed most of the lake trout in some of the Great Lakes. To control the lampreys, scientists put electric *weirs*, or fences, across streams to prevent the animals from spawning. Scientists have tested more than 4,000 chemical compounds, and discovered several that could kill larval lampreys without harming the fishes. These chemicals are now being used in streams to destroy all of the larval lampreys.

At one time lampreys were used for food in New England, and smoked "lamper eels" were considered a delicacy.

Scientific Classification. Lampreys belong to the subphylum *Vertebrata*, and the class *Cyclostomata*. They make up the order *Petromyzontia*. GEORGE A. ROUNSEFELL

See also HAGFISH.

LANAI. See HAWAII (The Islands).

LANCASTER was the name of the branch of the Plantagenet royal family that ruled England from 1399 to 1461. The House of Lancaster also ruled for a short time in 1470 and 1471.

John of Gaunt, 4th son of Edward III, founded the dynasty when he became Duke of Lancaster through his marriage to Blanche of Lancaster. The House of York stemmed from Gaunt's brother Edmund.

Gaunt's son became Henry IV in 1399, taking the throne away from his childless cousin, Richard II. This act led to the Wars of the Roses between the House of Lancaster and the House of York, which broke out more than 50 years later.

Henry IV's eldest son succeeded him as Henry V. Through his conquests in France, Henry V became one of the most famous warrior kings of England. In William Shakespeare's play *Henry IV*, he is identified as Prince Hal. Henry V died in 1422, leaving the throne to his baby son, Henry VI. All that his father won, the kindly but weak-minded Henry VI lost. The House of York defeated him in battle in 1461 and put Edward IV on the throne. Henry regained the throne for a few months in 1470-1471, but lost it when he was imprisoned in the Tower of London. He was murdered a few days later, and the direct line of the House of Lancaster came to an end. PAUL M. KENDALL

See also HENRY (IV) of England; JOHN OF GAUNT; WARS OF THE ROSES.

LANCASTER, Pa. (pop. 61,055; alt. 355 ft.), is the business center of Lancaster County, one of the richest farming regions in the United States. Lancaster has many associations with the early history of the country. It served as the capital of the United States for one day, Sept. 27, 1777, as Congress moved from Philadelphia to York. Lancaster Pike, the first modern highway in the United States, was built between Philadelphia and Lancaster in 1794. James Buchanan, the only Pennsylvanian to become President of the United States, lived in Lancaster. Visitors may see his home, called *Wheatland*.

Many of the early settlers of Lancaster came from Germany, and it still is a center of the Pennsylvania Dutch country. The "plain people," such as the Amish and Mennonites who live in the area, bring their products to Lancaster's famous farmers markets. See AMISH; MENNONITES.

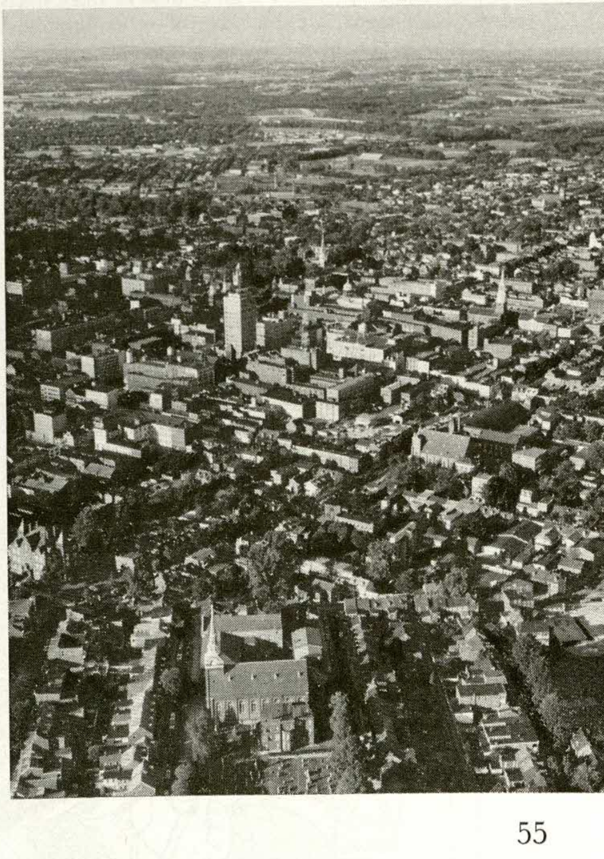
Location. Lancaster lies along Conestoga Creek in the southeastern part of Pennsylvania. It is about 40 miles southeast of Harrisburg, and 70 miles west of Philadelphia. For location, see PENNSYLVANIA (map).

Industry. The trade of Lancaster County, one of the wealthiest counties in the United States in value of its products per acre, is centered on the city. Large crops of wheat and tobacco grow in the region.

Lancaster ranks as an important manufacturing city.

Lancaster lies in one of the richest farming areas in the United States. The city is the main trade center for farmers in the area.

Maynard Clark



Its chief products include candy, cork, iron and steel goods, linoleum, textiles, toys, and watches.

The city is on the Lincoln Highway, near the Pennsylvania Turnpike, and acts as the central point for motor traffic in the region. Railroads and airlines also serve Lancaster.

Education. Lancaster is the home of Franklin and Marshall College, the Theological Seminary of the Evangelical and Reformed Church, and the Thaddeus Stevens Trade School. The city has about 20 public schools.

Government. Lancaster has a mayor-council form of government. It is the seat of Lancaster County.

History. The first settlers came to this region in the early 1700's. Lancaster was founded in 1718, chartered in 1742, and became a city in 1818. It is said to be the oldest inland city in the country. During the Revolutionary War, Lancaster kept Hessian prisoners taken at Trenton. Lancaster made guns for the patriots. The city served as the capital of Pennsylvania from 1799 to 1812. In the early 1800's, before the growth of newer industrial centers, Lancaster was the largest inland town in the United States.

S. K. Stevens

See also Fulton, Robert; Stevens, Thaddeus.

LANCASTER TURNPIKE was the first chartered turnpike in America. It was opened in 1797. It was a toll road from Philadelphia to Lancaster, Pa., a distance of 62 miles. A stock company built it at a cost of $465,000. The roadway was 37 feet wide, and was paved with stone to a width of 24 feet. The Lancaster Turnpike made its owners a great deal of money. Its success encouraged the building of other improved roads. See also Trails of Early Days (map).

LANCE. See Spear.

LANCELET. See Amphioxus.

LANCELOT, SIR, *LAHN seh laht,* in full Sir Lancelot du Lac, was one of the knights in the stories of King Arthur and the Round Table. In the earliest stories, Lancelot did not appear as the outstanding hero of the English people. But before A.D. 1200, through the influence of French romances, he became one of the most famous heroes of the Round Table. Later, Sir Thomas Malory said of him in *Le Morte Darthur:* "In all tournaments and jousts and deeds of arms, both for life and death, he passed all other knights, and . . . was never overcome but if it were by treason or enchantment."

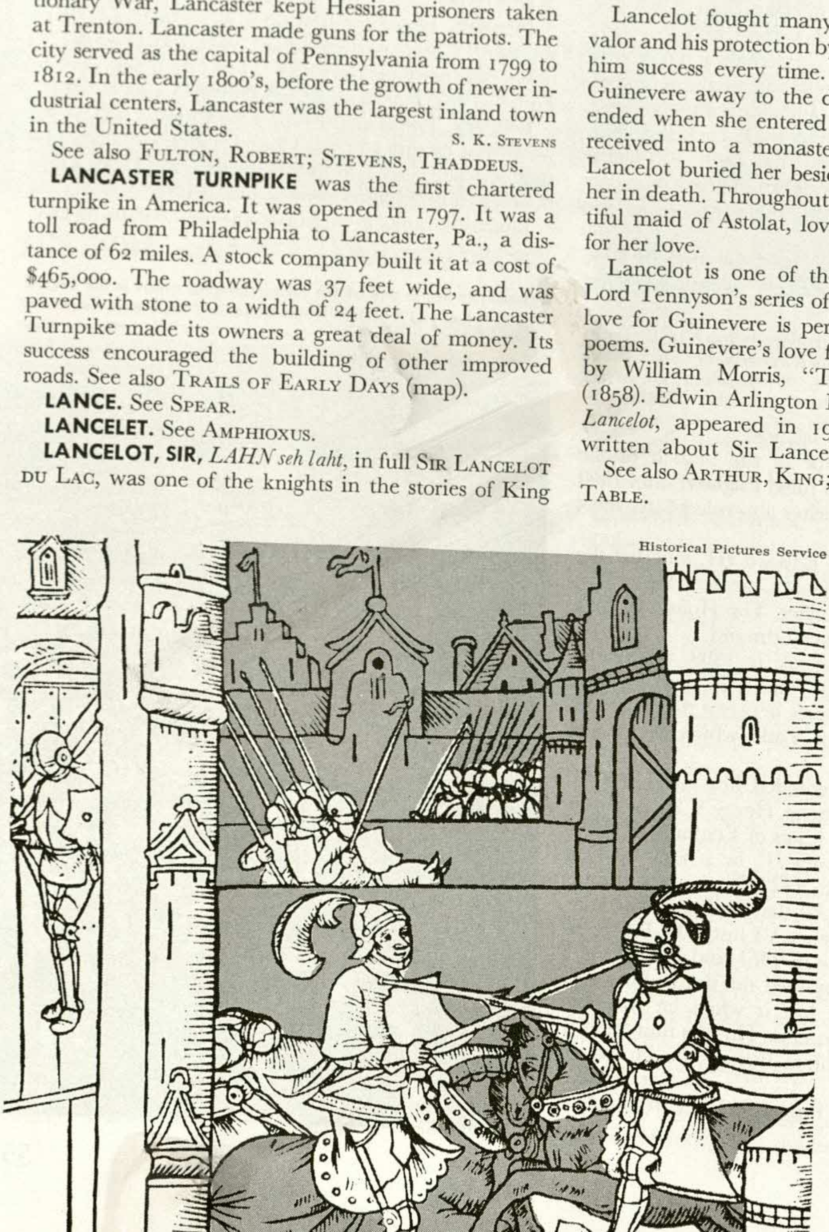
Lancelot was of royal birth, but was taken as a child by the Lady of the Lake. When he reached manhood, she brought him to Arthur's court. The tragedy of Lancelot's life was his love for Guinevere, Arthur's beautiful queen. Guinevere returned his love, eventually resulting in tragedy for her and Arthur, and in the breakup of the knightly brotherhood of the Round Table. Lancelot took part in the quest for the Holy Grail. But, because of his sins, he caught only glimpses of it.

Lancelot fought many combats for Guinevere. His valor and his protection by the Lady of the Lake brought him success every time. Lancelot's dreams of taking Guinevere away to the distant retreat of Joyous Gard ended when she entered a sanctuary. He himself was received into a monastery. After Guinevere's death, Lancelot buried her beside Arthur, and soon followed her in death. Throughout the legends, Elaine, the beautiful maid of Astolat, loved Lancelot. She finally died for her love.

Lancelot is one of the chief characters of Alfred, Lord Tennyson's series of poems, *Idylls of the King*. His love for Guinevere is perhaps the main theme of the poems. Guinevere's love for him is revealed in a poem by William Morris, "The Defence of Guenevere" (1858). Edwin Arlington Robinson's volume of poetry, *Lancelot*, appeared in 1920. Other poets have also written about Sir Lancelot.

Knox Wilson

See also Arthur, King; Idylls of the King; Round Table.



Historical Pictures Service

Sir Lancelot, *right,* one of the greatest knights of King Arthur's Round Table, fought singlehandedly against bands of knights to take over a castle. This woodcut comes from a story about Lancelot, printed in Paris in 1494.

LANCEWOOD is a tough wood used for archery bows, fishing rods, surveyors' rods, and tool handles. It comes from two types of trees that grow in tropical America. Scientists call these trees *Oxandra lanceolata* and *Calycophyllum candidissium*. Both these trees have wood that is yellowish brown in color, finely textured, tough, and extremely heavy. ARTHUR KOEHLER

LANCHOW, or **KAOLAN** (pop. 500,000; alt. 5,185 ft.), the capital of Kansu Province, is called "the gateway to China." For location, see CHINA (color map). As a frontier town, Lanchow has a varied population. Chinese officials and merchants in silk robes rub shoulders with coolies in blue cotton suits. Tibetans in woolen ear-muff hats meet Mongols carrying rifles and riding small, tough ponies. The city was the Chinese end of the Silk Road, a caravan path of the Middle Ages. Marco Polo and other traders traveled the Silk Road, carrying Chinese products westward from the Orient to western Asia and Europe. L. CARRINGTON GOODRICH

LAND. The surface of the earth consists of land and water. Land, the solid part, covers about 54,225,000 square miles, or about three tenths of the earth's surface. Land is made up of a variety of materials, including minerals, rocks, and soils. Land shapes include continents, plains, plateaus, mountains, hills, valleys, canyons, mesas, and buttes. See EARTH (The Land Areas).

To farmers, land is the soil they use to grow crops. Economists regard land as the natural wealth of the earth from which all goods are produced. Geographers think of land as a specific region or country. To city dwellers, land may mean a bit of space on which to erect a building. SAMUEL N. DICKEN

LAND, EDWIN HERBERT (1909-   ), invented the Polaroid Land camera, which takes and prints a finished picture in seconds. He also developed Polaroid plastic, a material that polarizes light. He holds more than 150 patents on plastics and on photographic and optical devices. In 1941, he invented a viewing system for three-dimensional pictures. Seven years later, he perfected a technique for observing living cells in their natural color. This technique proved an important research tool in studying cancer. Land was born in Bridgeport, Conn., and attended Harvard University. In 1937, he organized and became president of the Polaroid Corporation. BEAUMONT NEWHALL

See also POLAROID CAMERA.

LAND, MARGINAL. See RENT.

LAND, RECLAMATION OF. See RECLAMATION OF LAND.

LAND AND SEA BREEZES are coastal breezes that blow from sea to land in daytime and back to sea again at night. Such winds blow all year in warm climates, but only in summer in temperate regions.

As the land grows warmer during the day, the air pressure becomes lower there. The sea air, which is usually much cooler than the land air during the day, flows in over the land, beginning about noon. At night, when the land cools rapidly, the breeze blows over the water, which is warmer, and creates an area of low pressure. This breeze lasts throughout the night and until the middle of the morning. For several hours there are no breezes, because the temperatures of the air on land and sea are about the same. Land and sea breezes usually extend only a short distance over the land and water. VANCE E. MOYER

LAND BANK, FEDERAL. See FEDERAL LAND BANK.

LAND CRAB is an adult crab that lives on land. See CRAB.

LAND-GRANT COLLEGE OR UNIVERSITY is a school endowed under the Morrill, or Land-Grant, Act of 1862. Congress granted every state 30,000 acres of land for each senator and representative it had in Congress. The land was to be sold, the proceeds invested, and the income used to create and maintain a college for agriculture and the mechanical arts.

For several years men had been clamoring for colleges that would teach the finer points of farming and manufacturing. Finally the Land-Grant Act, sponsored by Representative Justin S. Morrill of Vermont, was passed. The act added military science and tactics to the proposed curriculum. Altogether, the states and territories received 11,367,832 acres of land. Congress added money to its gifts through the Second Morrill Act of 1890 and an amendment in 1907. Today, all the states and Puerto Rico receive grants from the federal government to help support land-grant colleges and universities.

Not all the states used the land-grant money as planned by the act. Thirty states, mainly in the Middle West and South, set up new agricultural and mechanical colleges. Eighteen gave the money to state universities to finance new agricultural and mechanical departments. Three gave the money to private colleges. Also, most of the states were unable to sell all the lands given them. The land they did sell was sold at a price so low that the states made almost no money.

But the educational value of the land-grant idea has been priceless. As a result of this program, old colleges have been able to expand, and new colleges have been created. Land-grant colleges include such well-known institutions as the universities of California, Illinois, Texas, and Washington. ALAN GRIFFIN

LAND MANAGEMENT. See PUBLIC LANDS.

LAND MANAGEMENT, BUREAU OF, is a federal agency with general responsibility for public lands in the United States. It seeks to protect these lands from improper use and poor management. An official engineering survey conducted by this office classifies the land according to its best use. Leases and permits are then issued to private individuals and companies for mining, timber production, or homestead farming so that the land's best use is obtained for the public interest. Grazing permits are also granted to stockowners under a policy that requires close supervision. The bureau must control grazing to prevent loss of turf and soil through erosion or flood. Through its Division of Forestry, the bureau also protects certain national forests from fire, insects, and disease.

The bureau was organized in 1946 as part of the Department of the Interior. It took over the functions of two previous agencies, the General Land Office and the Grazing Service. The bureau has headquarters in Washington, D.C., and field offices throughout the United States. The bureau's chief is called the Director for Land Management. JOHN C. BOLLENS

LAND OF ENCHANTMENT. See NEW MEXICO.

LAND OF FROST AND FIRE. See ICELAND.

LAND OF JEWELS. See EL SALVADOR (History).

LAND OF LINCOLN. See ILLINOIS.

LAND OF OPPORTUNITY. See IMMIGRATION AND EMIGRATION (Between 1841 and 1860); ARKANSAS.

LAND OF SHINING MOUNTAINS. See MONTANA.

LAND OF THE FREE. See UNITED STATES.

LAND OF THE MIDNIGHT SUN. See NORWAY.

LAND OF THE RISING SUN. See JAPAN.

LAND REFORM aims at improving the social and economic conditions of farmers. In the past, it fought remnants of feudal laws that prevented peasants from buying land. It also tried to modify the law of *primogeniture*, which allowed only the eldest son to inherit, thus concentrating land holdings. Advanced technology and political interference in buying and selling land have increased the tendency of a small number of persons to own a large part of the world's farm land.

One phase of land reform involves *redistribution* of land, or dividing large holdings among the landless. But more equal land distribution is not a sure cure for the ills of farming societies. Land reformers must consider that farm plots should not be too small to support a family, and that modern technology tends to reduce the size of the farming population. Many countries have provided greater opportunity for farmers to own their land by passing laws to assure clearer land titles, credit on reasonable terms, fair taxes, and better distribution of their products. Other reform laws have helped tenant farmers by protecting their rights, prohibiting unreasonable rentals, and improving farm wages.

Land reform may be a revolutionary slogan or program, and has often been exploited in political conflicts, especially between peasants and landholders. Communists promise land reform to attract followers of revolutionary movements. STEFAN T. POSSONY

LANDER COLLEGE is a coeducational liberal arts school at Greenwood, S.C. Courses lead to A.B. and B.S. degrees. The college emphasizes small classes, and has an active counseling program. It was founded in 1872 by Samuel Lander. It has a reading clinic and an integrated program of high school and college work. For enrollment, see UNIVERSITIES (table). B. M. GRIER

LANDES, BERTHA KNIGHT. See WASHINGTON (Famous Washingtonians).

LANDFALL. See NAVIGATION (Approaching Land).

LANDFORMS. See WORLD (Natural Factors).

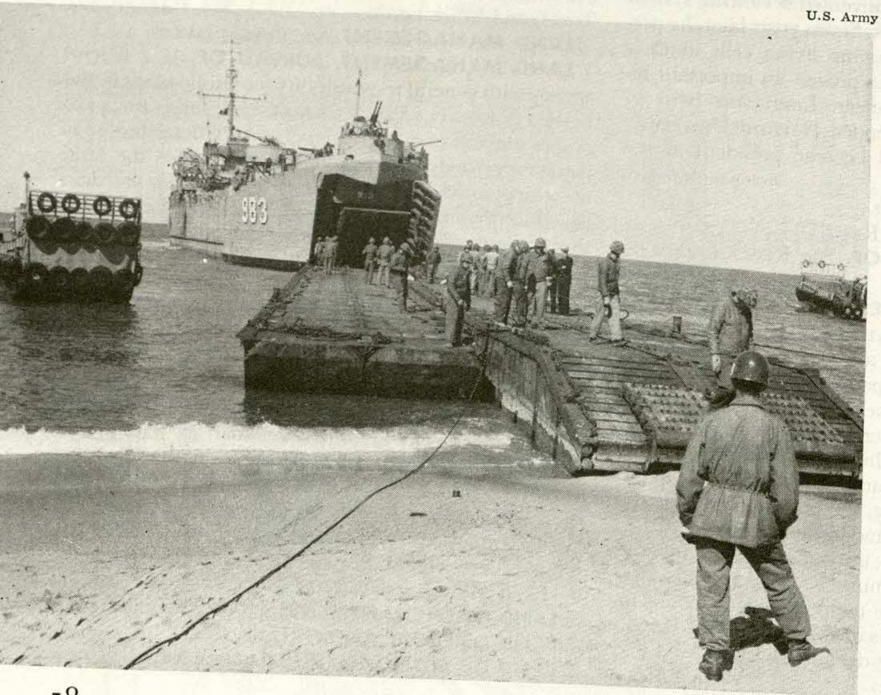
LANDING CRAFT are boats with shallow bottoms that can run up onto beaches. Large hinged doors at the bow of the boat open and allow tanks and trucks to drive over inclined ramps to shore. Powerful engines are used to back the boats off the beaches after they have been unloaded.

Small landing craft used during World War II include the *Landing Craft, Personnel, Ramp* (LCPR), which is 36 feet long and carries 36 men; the *Landing Craft, Medium* (LCM), which is 50 feet long and carries a tank; and the *Landing Craft, Infantry* (LCI), which is 157 feet long and carries 200 men.

The largest of the landing-craft group is the 4,000-ton *Landing Ship, Tank* (LST), an ocean-going ship that can unload several tanks, trucks, bulldozers, and field guns directly onto the beach.

A typical operation by landing craft begins before dawn. Minesweepers and underwater demolition teams, often called *frogmen*, clear away mines and beach obstacles in the shallow waters (see FROGMAN). Troop transports unload men and equipment into the landing craft. Ships far out at sea open fire on enemy shore positions. Fighting planes and bombers control the air and maintain sky cover for all landing operations. Landing craft, guided by special control boats, head for shore. Each craft aims for a spot that has been especially assigned to it in the invasion plan. Specially

U.S. Army



The Largest Landing Craft used by U.S. armed forces, the LST (Landing Ship, Tank), brings troops and equipment close to shore. They use a pontoon causeway, lashed to the LST ramp, to get to the beach.

equipped support craft near shore bombard the coast with rockets. The landing craft push up onto the beach, the ramps open, and men and vehicles establish the beachhead.

Landing craft were developed during World War II. They solved the age-old military problem of landing men and equipment on enemy shores. Before the end of World War II, the Allies had more than 25,000 landing craft of various sizes. T. C. Gillmer

See also Amphibious Warfare.

LANDING GEAR. See Airplane (Landing Gear).

Brown Bros.

Kenesaw Mountain Landis

LANDIS, KENESAW MOUNTAIN (1866-1944), an American judge, served as the first commissioner of professional baseball. During many years as judge of the U.S. District Court of Northern Illinois, Landis earned a reputation for fairness. In 1907, he won national attention by fining the Standard Oil Company of Indiana $29,240,000 for accepting freight rebates.

In 1919, the Chicago White Sox allowed the Cincinnati Reds to "win" the World Series. To protect baseball from further dishonesty and scandal, the club owners appointed Landis commissioner in 1920. He ruled baseball with an iron hand, and the game acquired an unquestionable reputation for honesty. Landis was born in Millville, Ohio, on Nov. 20, 1866, and died in Chicago. Ed Fitzgerald

LANDLORD. See Tenant; Lease.

Alfred M. Landon

LANDON, ALFRED MOSSMAN (1887-), was the Republican candidate for President in 1936. He and his running mate, Frank Knox, lost the election to Franklin D. Roosevelt and John Nance Garner.

Landon served two terms as governor of Kansas. He won the 1932 and 1934 elections despite the Democratic national landslide. Landon's ability to balance the state budget helped bring him the presidential nomination in 1936.

Landon was born in West Middlesex, Pa., and was graduated from the University of Kansas. In 1912, he and three partners established a company to develop oil wells. Landon became a leader in the petroleum industry. In 1928, he served as chairman of the Republican State Central Committee. George M. Waller

LANDOR, WALTER SAVAGE (1775-1864), an English poet, essayist, and novelist, won fame for his graceful but forceful style. His best-known work, *Imaginary Conversations* (1824-1848), consists of fanciful, philosophical discussions between great historic figures of the past.

Landor's other works include *Gebir* (1798), *Count Julian* (1812), *Idyllia Heroica* (1814), *Pericles and Aspasia* (1836), *Hellenics* (1847), *Last Fruit off an Old Tree* (1853), *Dry Sticks Fagotted by W. S. Landor* (1858), and *Heroic Idylls* (1863).

Landor was born in Warwick, England, and attended Oxford University. He spent much of his later life in Italy. He became almost as well known for his violent temper as for his writings. G. E. Bentley

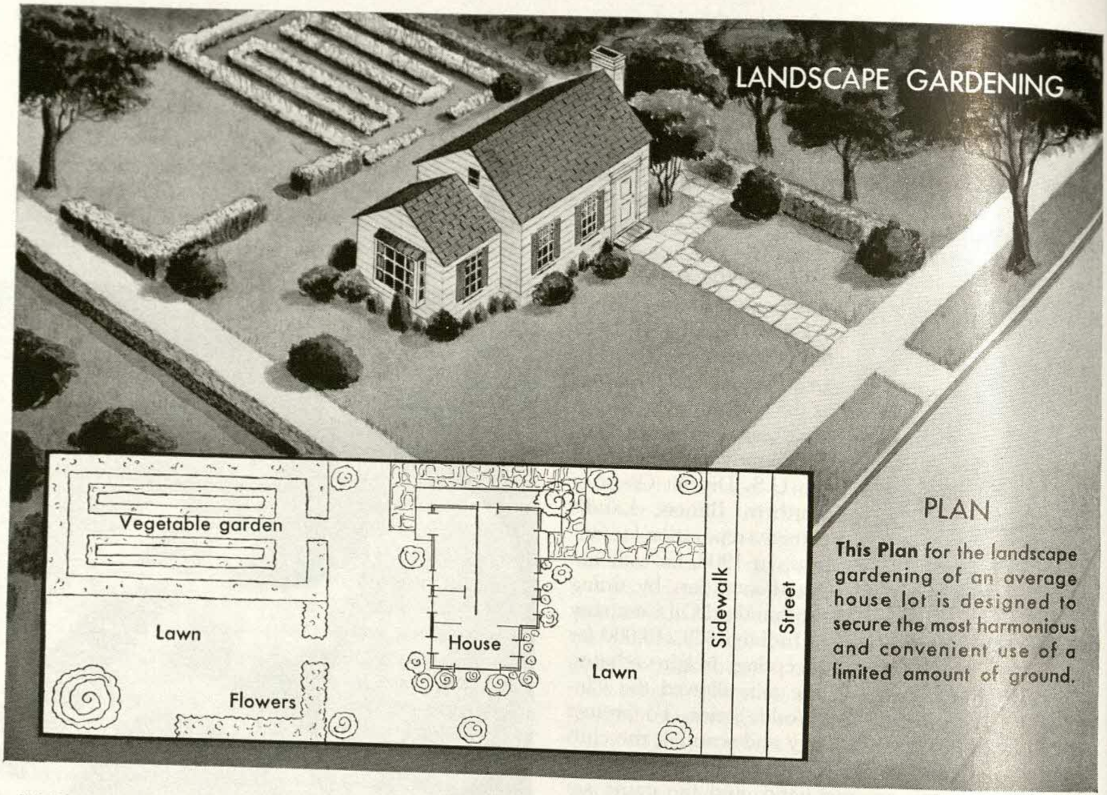
Page Toles, Black Star

Wanda Landowska helped revive interest in the harpsichord, a stringed instrument popular from the 1500's to the 1700's.

LANDOWSKA, *lan DAWF skuh,* **WANDA** (1879-1959), a Polish harpsichordist, pianist, and composer, revived an interest in music and musical instruments of the past. Beginning in 1906, she made concert tours throughout Europe and Africa, playing both the piano and the harpsichord. Gradually the harpsichord became her specialty. She made her North American debut in 1923, as soloist with the Philadelphia Symphony Orchestra. In 1925, Mme. Landowska founded a school near Paris that was dedicated to the study of early music. Forced to leave her home by the German invasion of France in 1940, she moved to the United States the next year. Her books include *The Music of the Past* (1923), of which her husband was co-author. Mme. Landowska was born in Warsaw, Poland. She died in her home in Connecticut. Robert U. Nelson

LANDS, PUBLIC. See Public Lands.

LAND'S END, a cape in Cornwall, is the westernmost point of land in England. It juts into the English Channel where the channel opens into the Atlantic Ocean. For location, see Great Britain (color map). Land's End is a granite promontory with cliffs between 60 and 100 feet high that have been carved into strange shapes by the waves. It is the last part of England seen from ships sailing west to the Americas. Longships Lighthouse, on a small island about a mile from Land's End, marks dangerous reefs. Francis H. Herrick



PLAN

This Plan for the landscape gardening of an average house lot is designed to secure the most harmonious and convenient use of a limited amount of ground.

LANDSCAPE GARDENING, also called *landscape architecture,* is the art or method of changing or enhancing natural surroundings so as to produce a more pleasing appearance. A house, no matter how beautiful, would look bare and unattractive in the middle of a prairie. But a simple cottage would also be out of place surrounded by an elaborate and stiffly formal garden. The landscape architect must make the grounds harmonize with the buildings.

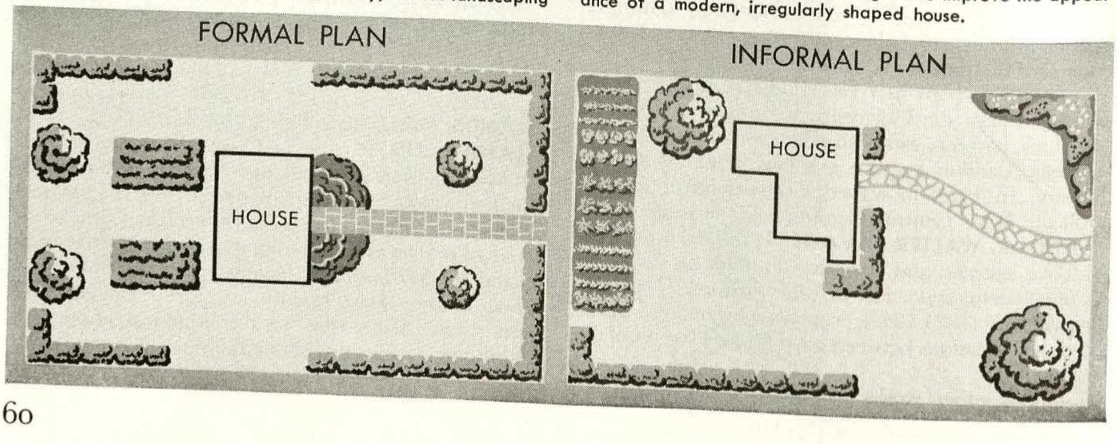
The garden may be only a small plot of land adjoining a small city house. It may be the huge grounds of a country estate. But most home owners or builders seek the advice of a landscape gardener in the same way that they would consult an architect to help them plan a house. The landscape gardener considers the place as a whole. His advice can often prevent costly mistakes in planting that might otherwise require later changes. The landscape gardener prepares the plan and specifications, and supervises the work, done by landscape contractors.

The landscape architect not only improves the grounds around private homes, but also plans parks, playgrounds, cemeteries, expositions, and gardens for community housing projects or public buildings. Landscape gardening is a branch of city planning.

Types of Landscaped Gardens. In general, landscape gardening is divided into two distinct styles, formal and informal. Sometimes both styles are combined, especially in the United States.

The Formal Garden has trees, lawns, shrubs, and

Landscape Gardening is intended to improve the appearance of a house. Different types of architecture require different types of landscaping. The balanced, stately, formal landscaping on the left would look well with Georgian architecture. The informal plan on the right was designed to improve the appearance of a modern, irregularly shaped house.



flowers laid out in regular designs. These shapes are usually based on geometric figures, such as squares, circles, ovals, and balanced figures. Formal gardening is best suited to closed or small spaces. It usually does not fit in well with the vast stretches of private estates or public parks. A famous example of a large formal garden is that of the Palace of Versailles, in France.

The Informal Garden is based on no fixed pattern. The landscape architect groups the plantings much as they would appear in nature. He avoids straight lines, sharp angles, or curves in elaborate patterns. He lays out the walks in winding, irregular courses. This natural, or English, style, as it is sometimes called, is suitable for both the small plot of ground and the large estate. It is especially well adapted to the public park.

Landscaping Your Own Lot is a pleasant hobby and a rewarding task. Before you start landscaping, make sure that your soil is rich enough to support plants. If possible have it tested, and add a layer of topsoil to areas where it has been stripped during construction. Before starting the landscaping, study your lot and decide what kinds of trees, flowers, and shrubs you want and where you should place them for the most pleasing effect. Also decide where sidewalks, patios, and fences should be placed.

Landscape Gardening in the United States began in the early 1800's. Andrew J. Downing is generally considered the first important American landscape gardener. He began the landscaping for the United States Capitol, White House, and Smithsonian Institution in 1851. Frederick Law Olmsted was the first man to call himself a landscape architect. He won fame during the late 1800's with his landscaping of Central Park in New York City and Prospect Park in Brooklyn. Olmsted, his son, Frederick Law, Jr., and a partner, Henry Sargent Codman, planned the landscape gardening for the World's Columbian Exposition in Chicago in 1893. This work set a standard for large-scale landscape gardening that has never been surpassed. The work of Jules Guerin at the Panama-Pacific Exposition at San Francisco in 1915 was perhaps equally notable. J. J. Levison

Related Articles in World Book include:

City Planning
Downing, Andrew J.
Gardening
Horticulture
Lawn
Olmsted
Repton, Humphry
Topiary Work

LANDSCAPE PAINTING. See Painting (What Do Painters Paint?).

LANDSLIDE occurs when a mass of earth or rocks slips down the side of a slope. Water seepage, cracks in rocks, and earthquakes are common causes of landslides. The action of waves on a coast line also may bring about a landslide. In politics, the term *landslide* means that one political party has received an overwhelming majority of votes.

See also Avalanche.

LANDSTEINER, *LAHNT shty ner,* **KARL** (1868-1943), won the 1930 Nobel prize in physiology and medicine for his discovery of the main types of human blood—A, B, AB, and O. His discovery made safe blood transfusions possible for the first time. In 1940, he and A. S. Wiener discovered the Rh blood factor, an important cause of stillbirths. Landsteiner also contributed information on how the body becomes immune to certain disease bacteria. In addition, Landsteiner proved that a virus causes poliomyelitis.

Landsteiner was born in Vienna, Austria. He moved to the United States in 1922, and was a member of the Rockefeller Institute for Medical Research (now Rockefeller Institute) from 1922 to 1939. Mordecai L. Gabriel

See also Blood (The A-B Factors); Rh Factor.

LANDSTING. See Sweden (Local Government).

LANDY, JOHN (1930-), an Australian track star, set a world record of 3 minutes 58 seconds for the mile run on June 21, 1954. His time in a meet at Turku, Finland, broke the record set a month earlier by Roger Bannister of England, the first man to run the mile in less than 4 minutes.

Landy's coach, Paul Cerutty, taught Landy that he could become a champion only by constant practice. Landy was born in Melbourne, Australia, and attended Melbourne University. Pat Harmon

LANE, HARRIET. See Buchanan, James (Life in the White House; picture).

LANE, JAMES HENRY. See Kansas (Famous Kansans).

LANE, JOSEPH. See Oregon (Famous Oregonians).

LANE COLLEGE is a coeducational liberal arts school at Jackson, Tenn. It is related to the Christian Methodist Episcopal Church. Courses lead to bachelor's degrees. The library contains special collections of material on Negroes, and on religion. Lane was founded in 1882, but took its present name in 1895. For enrollment, see Universities and Colleges (table).

LANFRANC, *LAN frangk* (1005?-1089), a Benedictine monk and scholar, served as the chief adviser of William the Conqueror. He became a Roman Catholic monk in 1042, and achieved distinction as the foremost teacher of his time at the monastery of Bec in Normandy, France. After William conquered England, he made Lanfranc archbishop of Canterbury. A monk and reformer at heart, Lanfranc reformed the monasteries of England.

When Berengarius was propagating his heresies on the subject of the Holy Eucharist, Lanfranc clearly upheld the orthodox teaching against him. Lanfranc's treatment of the subject, known now as transubstantiation, has been recognized as a work of lasting value (see Transubstantiation). Lanfranc was born in the city of Pavia, Italy. James A. Corbett and Fulton J. Sheen

LANG, ANDREW (1844-1912), a Scottish poet, historian, and anthropologist, is particularly known for his studies of folklore. In his book *Myth, Ritual, and Religion* (1887), Lang proved that folklore does not grow out of mythology, but is itself the foundation of mythology. He wrote on Homer and, with other scholars, translated the *Odyssey* (1879) and the *Iliad* (1883). He also rewrote and published many collections of traditional stories for children, such as *The Blue Fairy Book* (1889). His other works include several biographies and histories, and many volumes of graceful verse. Lang was born in Selkirk, Scotland. G. E. Bentley

LANGDELL, CHRISTOPHER COLUMBUS (1826-1906), dean of the Harvard Law School, introduced the "case-system" of study to American legal education. This system teaches the principles of law through the study of the original legal cases. It is now widely used in the United States. Born in New Boston, N.H., Langdell studied at the Harvard Law School. Daniel J. Dykstra

LANGDON, JOHN (1741-1819), a signer of the United States Constitution, was an American Revolutionary leader, a legislator, and a merchant. During the Revolutionary War, he organized and financed an army to fight the British, and served in the Continental Congress. He was the chief executive of New Hampshire in 1785 and 1788, and was its elected governor from 1805 to 1811, except for 1809. He served as a U.S. Senator from 1789 to 1801. Langdon was born in Portsmouth, N.H.

Robert J. Taylor

LANGEN, EUGEN. See Gasoline Engine (Development).

LANGER, WILLIAM. See North Dakota (Famous North Dakotans).

LANGFORD, NATHANIEL PITT. See Montana (Famous Montanans).

LANGLAND, or **LANGLEY, WILLIAM** (1332?-1400?), ranks second only to Geoffrey Chaucer among English poets of the 1300's. The *Vision of Piers Plowman* (1362?) is credited to him, but some scholars believe it was the work of several men. The vision of Piers, who may have been Langland himself, presents scenes of sin judged by Christian standards. The poem teaches ways of life that will win salvation for man. Langland was probably born in the region of Shropshire, England, and studied at the Benedictine monastery at Great Malvern. He probably wrote his famous poem in London, where he later lived and died.

George F. Sensabaugh

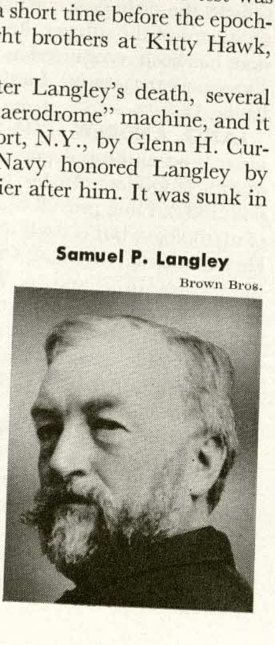
LANGLEY, SAMUEL PIERPONT (1834-1906), was an American astronomer, physicist, and pioneer in aeronautics. His interest in aerodynamics, or the theory of flight, led him to experiment with heavier-than-air flying machines. His power-driven models made a few successful flights of about half a mile in 1896. The United States government later gave Langley $50,000 to build a man-carrying "aerodrome." This machine twice was launched from a houseboat on the Potomac River in 1903. Both tests failed, but one using a smaller model succeeded. The second full-size model test was made in December, 1903, a short time before the epoch-making flight of the Wright brothers at Kitty Hawk, N.C.

In 1914, eight years after Langley's death, several changes were made in his "aerodrome" machine, and it was flown at Hammondsport, N.Y., by Glenn H. Curtiss. The United States Navy honored Langley by naming its first aircraft carrier after him. It was sunk in the Java Sea early in 1942. A second carrier named *Langley* served later in World War II.

Langley was born in Roxbury, Mass., and attended Boston Latin School. He spent several years studying architecture and engineering before turning to astronomy, in which he had been interested since boyhood. His several inventions included an instrument called the *bolometer*, which measures the amount of radiation from the sun (see Bolometer).

Samuel P. Langley

Brown Bros.



From 1867 to 1887, Langley was professor of physics and astronomy, and director of the Allegheny Observatory, at the Western University of Pennsylvania in Pittsburgh. He served as secretary of the Smithsonian Institution from 1887 until his death. While in this office, he established the National Zoological Park and the Astrophysical Observatory. Langley's writings include *Experiments in Aerodynamics* (1891) and *The Internal Work of the Wind* (1893).

Paul Edward Garber

See also Airplane (Early Experiments); Curtiss, Glenn H.

LANGLEY AIR FORCE BASE, Va., serves as headquarters of the U.S. Air Force Tactical Air Command. It covers 8,532 acres and lies next to Hampton. The base was established in 1917 as an experimental station. It was named for Samuel Pierpont Langley, an American air pioneer (see Langley, Samuel Pierpont). Since 1935, the base has been the center of tactical air units that support ground forces. The National Aeronautics and Space Administration operates a major research center nearby.

John H. Thompson

LANGMUIR, *LANG myoor*, **IRVING** (1881-1957), won the 1932 Nobel prize in chemistry for his work in surface chemistry and in the electron theory of matter. His investigations of surface films led to important advances in the study of microorganisms. Langmuir also did research in physics and engineering. He helped develop the gas-filled incandescent bulb, the vacuum tube, an atomic hydrogen welding process, and a way to produce rain and snow by seeding clouds with dry ice.

Langmuir was born in Brooklyn, N.Y., and studied at Columbia University and Göttingen, Germany. He conducted research at the General Electric laboratory from 1909 to 1950.

Herbert S. Rhinesmith

LANGSTON UNIVERSITY is a state-controlled coeducational school at Langston, Okla. It has colleges of arts and sciences, education, home economics, agriculture, and industrial arts. Langston grants A.B. and B.S. degrees. The university was founded in 1897. For enrollment, see Universities (table).

G. L. Harrison

LANGTON, STEPHEN CARDINAL (1165?-1228), one of England's greatest archbishops of Canterbury, was a famous theologian, Biblical scholar, and statesman. In the late 1100's, he became known as the greatest commentator on the Bible.

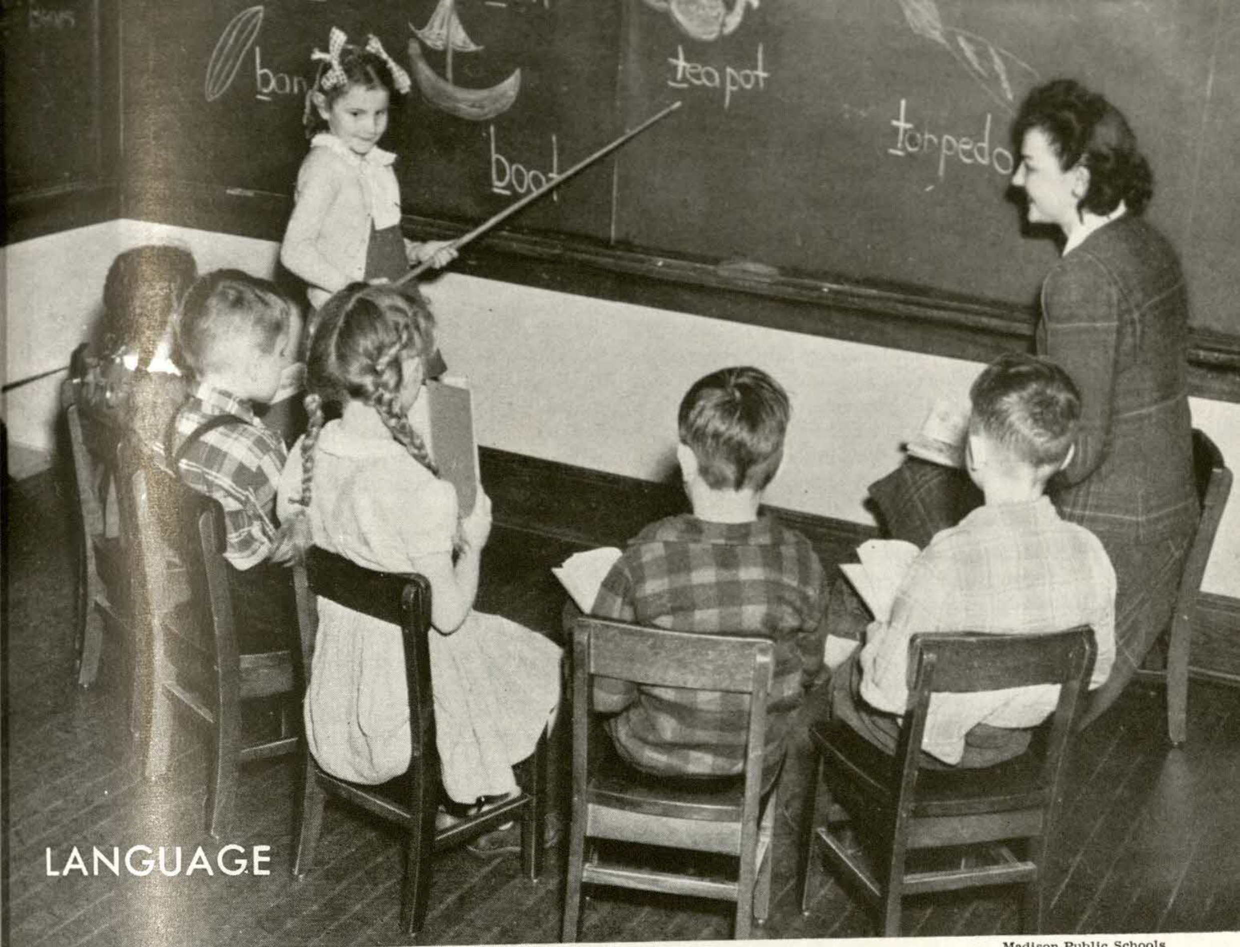
When King John wished to choose his own candidate as archbishop of Canterbury, Pope Innocent III objected and appointed Langton in 1205. The king refused to accept him, and Langton had to remain in exile in France. The pope placed England under an interdict, and excommunicated the king in order to force him to accept Langton. John finally accepted Langton in 1213. As archbishop, Langton defended the freedom of the church and worked to restore peace between the king and his barons.

James A. Corbett and Fulton J. Sheen

LANGTRY, LILY (1852-1929), a British actress known as "Jersey Lily," became a stage favorite in England and the United States. The town of Langtry, Tex., was named after her. Her most famous role was that of Rosalind in William Shakespeare's *As You Like It.* Oscar Wilde wrote *Lady Windermere's Fan* (1892) especially for her. She was born at St. Helier, Jersey, one of the Channel Islands. Her real name was Emily Charlotte le Breton.

Richard Moody

LANGUAGE



Madison Public Schools

Language is one of man's most important tools. Children spend a large part of their early years learning to use language, with practice in reading, writing, and speaking.

LANGUAGE is the basis of all human relationships. Birds and other animals also appear to be able to make sounds which have meaning. They can show fear, pleasure, or desire by whining, barking, or chirping. But they cannot express ideas. Men are able to say almost anything they feel or think.

Language is not a finished product like a picture or a table. It is always changing. New words are added, and old words go out of use. Sentence structure changes, and rules of grammar are changed by usage. Chaucer in the 1300's wrote his *Canterbury Tales* in English. But between the time of Chaucer and the present day, English has changed a great deal. It is hard for many readers today to understand Chaucer's English. For example, the first 18 lines of *The Canterbury Tales* appear at the bottom of the next page as he wrote them, and with a translation into today's English.

Language is an artificial tool. A baby is not able to talk when he is born. He has few wants and he can usually get what he wants by crying. But as a baby grows, his wants grow, and he needs to express more ideas. In time, a baby learns that certain sounds mean definite things to people around him.

The first rule of speech is that the people to whom we are talking must understand what we mean by the sounds we make. The child who is learning to talk must learn a great deal about meaning. Often, one of the first words a child learns is *dog*. Many children think at first that all four-legged animals are dogs. It takes some time to learn that only one particular animal is a dog, and that others are called cats or cows. But this is only the first step in the learning of meanings.

Children must learn that the same sound does not always mean the same thing. They must learn that *fall* can sometimes mean *to fall down* and that it can also mean *a season of the year*. A child finally learns all these things. But what he has learned is an artificial thing. There is no reason why *dog* should mean dog. We could call a dog a *cat*. We could say *wet* for *dry* and *dry* for *wet*. But to be understood, everyone would have to change the meanings of the sounds at the same time.

Language means what people have decided it should mean. The words are a part of language, but they are not the whole part. Sounds are useless without meaning.

Written language is just as artificial as spoken language. Our alphabet is simply a set of signs or marks which has been adopted to stand for the sounds in our language. If we wanted to, we could write the sounds of *a*, *b*, and *c* as ⊓, ⊏, and □. It would make no difference in the language itself. We do not stick to any fixed system even with our alphabet. We often use the same set of letters to make different sounds, or use different sets of letters to make the same sound. Read can be pronounced the same as reed, or it can be pronounced the same as red. We pronounce *-ough* in many different ways in such words as *through, though, ought, tough, plough,* and *trough.* We are able to read our language only because we have accepted certain definite combinations of letters as standing for certain definite words.

How Languages Began

There are several guesses as to how man first began to talk, but no one knows for certain exactly how this happened. Some students of language think that people first began to talk by making the same sounds that birds and animals make. Other language scholars believe that words were made to imitate the sounds man heard around him. Such words as *buzz* probably did start in this way, but most words cannot be explained in this fashion. Other scholars have made other suggestions, but none of them is an entirely satisfactory explanation. It is most likely that all these guesses have a little truth in them. Language probably did not grow according to a plan. Instead, it grew as people needed it, in the same way that languages grow today. The languages that exist today are not perfect. Some ideas are difficult to express in them. Some ideas are too easy to express, because we have too many ways of expressing them. But language still remains the best means we have for communicating with each other.

How Languages Grow

Many things influence the ways in which a language grows. Wars, trade, and movements of people have decided whether a language would spread or die out. At one time, Latin was the dominant language of a large part of southern and western Europe. Roman armies had carried it with them as they conquered new lands for Rome. But when the Roman Empire decayed and fell to invaders from the northeast, the Latin language almost died out. Today the Roman Catholic Church still uses Latin, but its only other uses are in writing prescriptions for medicines and in naming plants and animals scientifically. The first colonists to settle in North America were English, and their language became the language of the United States. Spaniards settled in Latin America, and Spanish became the language of most South American countries. American, British, and Canadian businessmen do such a large part of world trade that English is rapidly becoming a "second language" of many people in all parts of the world.

Languages also grow within themselves. Contact with peoples from other countries makes languages richer. English was largely an Anglo-Saxon dialect before the Norman French conquered England in 1066. The Normans spoke French, and the people gradually combined Anglo-Saxon and Norman French to form much of the English language. The Anglo-Saxons had used the word *cow* for both the animal and its meat. The French had two words, one for the animal and one for the meat. They called the meat *boeuf*, and we took the word *beef* from that.

We also add to our language by making new words when we need them. Sometimes such new words seem to come out of nowhere. Others are made artificially. Many names for recent inventions were made from Greek and Latin words. Such words as *telephone*, *phonograph*, and *automobile* are examples of such *made* words. Another way in which language grows is through *slang*. We think of slang as being something new, because the slang words we know are new. But slang is as old as language itself. Slang words are simply words that have

HOW ENGLISH HAS CHANGED—CHAUCER TO THE PRESENT

Chaucer's English, as he wrote *The Canterbury Tales* in the late 1300's, is difficult for us today without a translation.

Whan that Aprille with his shoures sote
When April, with its sweet showers,

The droghte of March hath perced to the rote,
has pierced the drought of March to the root

And bathed every vein in swich licour,
and bathed every vein in such [sweet] liquor,

Of which vertu engendred is the flour;
of which virtue the flower is engendered;

Whan Zephirus eek with his swete breeth
when Zephyrus [the west wind] with its
sweet breath

Inspired hath in every holt and heeth
has inspired in every wood and heath

The tendre croppes, and the yonge sonne
the tender crops, and the young sun

Hath in the Ram his halfe cours y-ronne,
has run half its course through the Ram
[a sign of the zodiac],

And smale fowles maken melodyë,
and small birds make melody

That slepen al the night with open yë,
that sleep all night with open eyes

(So priketh hem nature in hir corages):
(so much does nature inspire their hearts);

Than longen folk to goon on pilgrimages
then folk begin to long to go on pilgrimages

(And palmers for to seken straunge strondes)
(and pilgrims to seek strange shores)

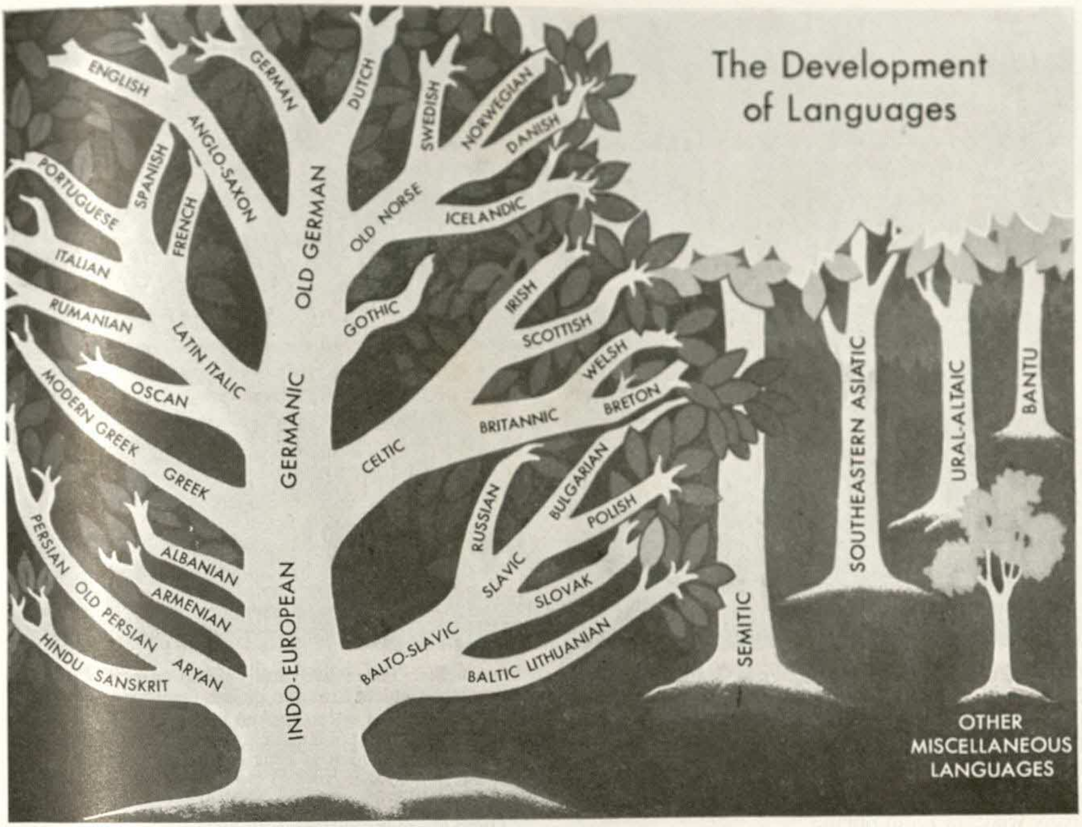
To ferne halwes, couthe in sondry londes;
to faraway holy places, known in many lands;

And specially, from every shires ende
and specially, from every shire's [district's] end

Of Engelond, to Caunterbury they wende,
of England, to Canterbury they wend,

The holy blisful martir for to seke,
to seek the holy blissful martyr

That hem hath holpen, whan that they were seke.
that helped them when they were sick.



The Development of Languages

not yet become an accepted part of the language. They may die out, or they may finally be accepted. Few people today would understand such words as *grego*, *grouty*, or *grooly*. All were once popular slang words. Such other words as *bunk*, *hoodlum*, and *fizzle* were once slang, but they have now become part of the language.

History

We do not know what was the first language. Many scholars believe that there were several "first" languages, all of which began separately. Our modern tongues grew from these various basic languages. The first evidence of language dates back only to about 4000 B.C. But it is likely that languages existed in a spoken form a long time before that. According to the known records, only five languages date as far back as 1850 B.C.

The Indo-European Group. Most languages appear to have grown out of older languages, of which there is no record in many cases. We can only guess that they must have existed, because of likenesses between various newer languages. The languages of the peoples of Europe and parts of Asia appear to have come from a mother language which scholars call *Indo-European*.

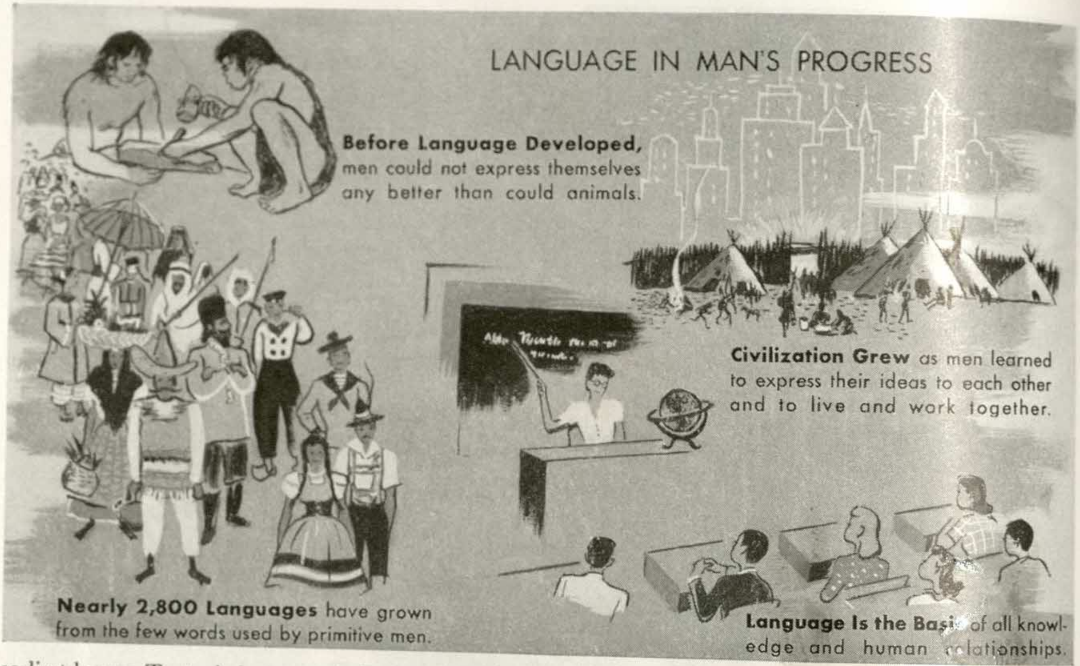
Scientists believe that a very long time ago a group of people lived in Central Europe who spoke this language. There is no record of the language itself. It is believed that these people grew in numbers and began to move to other parts of the continent. Some went to the country we now call Greece. Others went to Italy, France, and England. Some moved north to the Baltic countries, and others went east to Russia. The farthest any seem to have gone was Asia Minor and northern India. These groups took their language with them. But once they were separated from each other, their mother language began to change. The original stock of words remained, but sounds and forms were gradually changed. We are not sure why these changes took place.

Each group from time to time also found the need to make new words, and each group made different new words. It is a law of language that a language becomes simpler as it grows older. All languages tend to drop the special word endings which stand for gender and case and are called inflections. The Indo-European languages all became simpler. In the end, members of the various groups all talked different languages. The main languages which came from Indo-European are the Greek dialects, Albanian, the Italic tongues, Celtic, Teutonic, Slavic, Hittite, Armenian, Iranian (Persian), and Indian (Sanskrit, Bengali, Hindi, and others).

The main body of Indo-European languages broke up into other language groups. The Romance languages make up one of the most important of these. Latin was the mother of the Romance languages, which include Italian, French, Spanish, Portuguese, and Romanian.

Little is known about the breakup of the old Indo-European language called Celtic. It is clear that Gaulish was once spoken in both Western Europe and Asia Minor. It has long been dead. Cornish was a Celtic tongue, but it died out in the early 1800's. Modern Welsh, Breton, and Gaelic all have the same Celtic mother tongue.

Another Indo-European subgroup is Teutonic. The


LANGUAGE IN MAN'S PROGRESS
Before Language Developed, men could not express themselves any better than could animals.
Civilization Grew as men learned to express their ideas to each other and to live and work together.
Nearly 2,800 Languages have grown from the few words used by primitive men.
Language Is the Basis of all knowledge and human relationships.

earliest known Teutonic language is Gothic, which has been dead for hundreds of years. Such modern languages as Icelandic, Norwegian, Swedish, Danish, Dutch, Flemish, English, and German are related to Gothic. English itself is a combination of Anglo-Saxon and Norman French. It is a Teutonic language, with many words of Latin origin.

Other Groups. There are at least one hundred and fifty language groups which have no apparent relation to each other. Of these, about one hundred and twenty-five are American Indian language groups. The Indo-European is the most important of all the groups. Its languages are spoken by the largest number of people in the world, and their literature is the most significant. But other language groups are also important.

In Asia Minor and northeastern Africa, many people speak languages of the *Hamito-Semitic* group. In this group are such languages as early Egyptian (later Coptic), Ethiopic, Aramaic, Hebrew, Phoenician, Assyro-Babylonian, and Arabic. Many of these languages are dead, but the peoples of the Middle East, northeastern Africa, and Malta speak languages descended from, or related to, them.

Of the other language groups, the most important are:

Uralic including Finnish, Estonian, Lapp, and Hungarian.

Altaic — Turkish, Mongolian, and Manchu.

Sino-Tibetan or Indo-Chinese—Chinese, Tibetan, Burmese, and Siamese.

Japanese and Korean.

Malayo-Polynesian including the languages of Malaya, Indonesia, and other islands of the Southwest Pacific.

Papuan, of which about 130 varieties are spoken by the peoples of New Guinea and nearby islands.

Australian. There are about 100 different languages which are not clearly related but are grouped together because they are spoken by the aborigines of Australia.

Eskimo-Aleut is a group of languages spoken by the peoples of the Aleutian Islands, as well as the Eskimos of Alaska, Greenland, Labrador, northern Canada, and northeastern Siberia.

Caucasian. There are many languages included in this group, which are not clearly related. The most important of these is that spoken by the Georgian people in the southern part of Russia.

Ibero-Basque, which is spoken by the Basque people of Spain and France.

There are many different dialects spoken by the peoples of Africa south of the Sahara Desert, such as the Bantu and the Swahili. They have been grouped into three main divisions. These are the *Sudano-Guinean* tongues of Central Africa, the *Bantu* languages of southern Africa, and the *Hottentot-Bushman* languages of scattered groups of Pygmies.

By far the largest number of language groups are those of the peoples of the Americas. None of these seems to be related to any other languages in the world. Many do not even appear to be related to each other. There are more than twelve hundred known American Indian languages. They are usually grouped according to the area in which they are or were spoken — *North American*, *Mexican and Central American*, and *South American* (including the West Indies).

North American Indians apparently spoke about 350 different languages, and scientists have grouped them in about 50 language families. These 50 families are grouped in six super-families: Algonkian-Wakashan, Aztec-Tanoan, Hokan-Siouan, Nadene, Penutian, and Eskimo-Aleut (classed here as a language group). We know little about the languages of the Indians of Central America, South America, and the West Indies. There may have been as many as 800 languages in these areas, divided into about 77 language groups.

Auxiliary Languages. Communications have developed, and contact between the various nations has increased. The difficulties caused by differences in languages have grown. Many people have believed it would be much better if all peoples spoke the same language. Trade would be easier and understanding between nations would grow. Such international organizations as the United Nations could function more smoothly if the delegates spoke the same language (see United Nations [Simultaneous Interpretation]). Some persons have tried to work out world-wide languages.

The first salesmen of an international language invented special auxiliary languages, which were mixtures of various tongues. The best known of these have been Volapük, Ido, and Esperanto. Esperanto became the most popular in Europe and the United States. Experts in Esperanto have attended international conferences and report they have talked freely and naturally with persons using more than a score of languages. But Esperanto and the other auxiliary languages have never been tested on a widespread scale.

We speak of languages having a "feel." No Chinese can ever really get the "feel" of French, and no Frenchman can ever really get the "feel" of Chinese. And few persons can get the "feel" of an auxiliary language. It lacks the warmth and human appeal of a native tongue. It is also difficult to get people to learn an auxiliary language unless they know that it will be practically useful. People who promote such languages have not yet been able to get enough people to learn them, so that a large number of other people would think it worth their time also to learn them.

Since the 1930's a new form of international language has made some progress. It is called Basic English. This language uses 850 English words. The advocates of the language say that anything can be expressed in these 850 words, and that the language can be learned easily and quickly. Attempts have been made to teach Basic English as an international "second language." It is not set up to replace other languages, but merely to be a common language known to most of the people on earth. It would be used for international dealings. Basic English has had some success. See Basic English.

The Study of Language

Language is the most important study of our schools. Elementary-school students spend fully half their time studying subjects related to language. The learning of most other subjects depends on the student's understanding of language.

Language is first learned in the home. The child imitates what he hears said around him. As a baby, the child will learn one language as easily as another. American children born in China and brought up by Chinese servants often learn Chinese before they learn English. The learning of language continues to be imitative during the first years of elementary school. In the lower grades a child is taught not only what to say and what not to say, but also how to read and how to spell.

Analysis of Language. In later years, children are taught a systematic study of language. All languages have some kind of organization. A child must understand this organization to have full use of language as a tool. Languages differ in sounds and in form. But they all have the same basic design. There are different kinds of words, classed according to their use. The main kinds, called *parts of speech*, are nouns, verbs, and modifiers. All languages have these kinds, and some also have other kinds. Nouns are words which stand for things or ideas. Verbs express action. Modifiers limit the meanings of nouns and verbs.

Each word has a separate meaning or group of meanings. Words are put together to express an idea. These groupings of words are called *sentences*. There are different kinds of sentences, classed according to their form and purpose. The expression of ideas in the civilized languages is often done in a very complex fashion. Many clauses and phrases are used.

Photo by Gus Pasquarella, reprinted by courtesy of *The Saturday Evening Post*, © 1959, by Curtis Publishing Co.

Learning to Speak and Understand Foreign Languages has become a popular part of some elementary school-curriculums.

Writing and Conversation. Students must be taught the form of their language and how to use it best. The ability to speak and write well is essential for success in many fields. Speaking and writing are normal parts of our daily routine. But they can also be an art.

Students are taught how to use their knowledge of reading and writing in the best way. A study of the works of great writers is one of the best ways to learn how to write well. Schools pay much attention to courses in literature for this reason. A student may never become a great writer. But the study of literature will help him to learn how to express himself clearly, and to appreciate the beauties of his own language.

Speaking is more important for most people than writing. It is the basis of all social relations. People who can talk well often make good in business and make many friends as well. Speaking is learned mostly through imitating what we hear others say. For this reason it is important that parents and teachers watch their own speech carefully. A person's speech habits are formed in childhood. Few persons who learn to speak with a distinct accent lose that accent even if they move to an area where it is not used. Adults also find it hard to lose bad habits of grammar, vocabulary, and sentence construction. Pupils are taught how to speak in early years of school by having many opportunities to speak. They tell stories or give facts. Teachers can continue in the later grades to correct bad speech during recitations. In high schools and colleges, courses in speech and dramatics help to develop conversational and speaking abilities. See Debate; Public Speaking.

Advanced Language Studies. Some scholars devote themselves to the study of languages. They learn many important things about the beginnings of language and about the meanings of words. Many of these discoveries have helped in the understanding of human history. There are two main branches of language study. *Philology* studies the beginnings and the growth of languages. *Semantics* is concerned with the meanings of words and their effect on society.

ROBERT SHAFER

Related Articles. See the LANGUAGE and LITERATURE sections of the READING AND STUDY GUIDE for a list of articles on language in WORLD BOOK. See the Languages sections of the various continent articles, such as ASIA (Languages). See also the following articles:

LANGUAGES OF THE WORLD

Aramaic
Aryan
Basic English
Celt
Chinese Language
English Language
Esperanto
Flemish Language and Literature
French Language
Gaelic Language
German Language
Greek Language
Hawaii (The People)
Hebrew Language and Literature
Indian, American (Languages)
International Language
Italian Language
Japanese Language
Latin Language
Portuguese Language
Romance Language
Russian Language
Sanskrit Language and Literature
Semitic Language
Sign Language
Spanish Language
Syriac
Teuton
Universal Language
Yiddish Language and Literature

UNCLASSIFIED

Alphabet
Choral Speaking
Communication
Composition
Conversation
Dialect
Dictionary
Etymology
Grammar
Idiom
Jargon
Literature
Philology
Pronunciation
Rhetoric
Semantics
Slang
Speech
Spelling
Vocabulary
Writing

Outline

I. How Languages Began
II. How Languages Grow
III. History
  A. The Indo-European Group
  B. Other Groups
  C. Auxiliary Languages
IV. The Study of Language
  A. Analysis of Language
  B. Writing and Conversation
  C. Advanced Language Studies

Questions

What is one explanation of how men first began to talk?

What are the *Romance* languages?

Why is it especially important for little children to hear good language at all times?

What mother tongue was probably the source from which most languages in Asia and Europe developed?

Why is English rapidly becoming a second language for people in many parts of the world?

What is Basic English?

How many known Indian languages are there? How many of them are found in North America?

What are some examples of invented words?

How did the Anglo-Saxons happen to add French words to their language?

What are some of the things that influence the growth of language?

LANGUAGE ARTS is a term used in American elementary and secondary education to refer to training in reading, writing, and speaking, as distinguished from training in literary appreciation and scholarship. The term is also used in many colleges and universities. Language arts, also referred to as "programs in communication," freely utilizes all knowledge, especially the social sciences and psychology, in the study of language and literature.

Beyond the elementary stages of reading, writing, and speaking, language arts includes a variety of topics: phonetics (for the improvement of pronunciation), remedial reading, linguistics, semantics (for the improvement of comprehension), creative writing, and bibliotherapy (the study of the kinds of reading that promote emotional growth and health). Language arts also includes the following studies: literature as a source of psychological and social insights (rather than exclusively as an art), the effects on society of mass communication (motion pictures, newspapers, radio, and television), and the relations between language and culture.

The difference between the traditional approach to literature and the language-arts approach may be roughly described as that between the consumer viewpoint (learning to enjoy literature) and that of the producer (learning to perform language skills and understand their operation).

S. I. HAYAKAWA

For a detailed list of related articles in WORLD BOOK, see the heading The Language Arts in the LANGUAGE section of the READING AND STUDY GUIDE.

LANGUE D'OC and **LANGUE D'OÏL** are two French dialects that emerged in the Middle Ages. They are often called the *languages of yes*, because the word for *yes* was *oc* in southern France and *oïl* in northern France. Modern French developed from the langue d'oïl.

See also FRENCH LANGUAGE (Developments).

LANIER, *luh NEAR,* **SIDNEY** (1842-1881), is considered by some critics as one of the greatest American poets. But others attack him for "feverish intensity," "provinciality," and "moralizing."

Lanier was troubled by the apparent conflict between religion and scientific theories of the 1800's. He used his poetry to express social concerns and social consciousness. "Corn" (1875) was called the first American poem on an agricultural subject. When "The Symphony" appeared later that year, people were amazed that Lanier had been able to write a poem on the money question. His best-known poems include "Sunrise," "The Marshes of Glynn," "Song of the Chattahoochee," "An Evening Song," and "A Ballad of Trees and the Master." A volume of his poems was published in 1877, and a complete collection appeared in 1884.

Sidney Lanier

Brown Bros.

A self-educated musician, Lanier was considered the greatest flute virtuoso of his time. He performed with the Peabody Orchestra in Baltimore and with the Thomas Orchestra. His musicianship influenced his theory and practice of poetry.

Lanier was born in Macon, Ga. He had just been graduated from Oglethorpe University and was planning to go to Germany for graduate study when the Civil War broke out. He joined the Confederate forces. Four years in a Union prison ruined his health, and the war itself stripped him of his fortune.

After the war, Lanier studied law and worked as a hotel clerk. In 1879, he began lecturing on English literature at Johns Hopkins University. He edited books for boys during his last years, of which *The Boy's King Arthur* (1880) was the most popular. Lanier was a man of great nobility of spirit. The author, T. W. Higginson, called him "the Sir Galahad among our American poets." EDWARD WAGENKNECHT

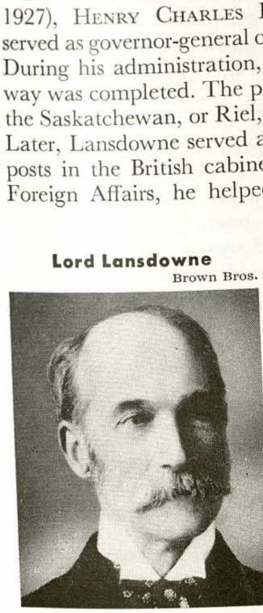
LANKESTER, SIR EDWIN RAY (1847-1929), a British zoologist, did extensive research in comparative anatomy and embryology. His work helped support the theory of evolution (see EVOLUTION [The Theory of Evolution]). Lankester served as director of the British Museum's natural history department from 1898 until his retirement. From 1869 to 1920 he edited *The Quarterly Journal of Microscopical Science*. Lankester was born in London and studied at Cambridge and Oxford universities. MORDECAI L. GABRIEL

LANOLIN, *LAN oh lin*, is a common name for *wool wax*, which is made from a greasy coating found on sheep's wool. The name is used especially when the wax is purified and mixed with water. Lanolin is a yellowish, sticky substance, as thick as ordinary wax. It does not react readily with acids or alkalies. It will absorb from 25 to 30 per cent of its own mass in water. When lanolin is mixed with water, it breaks up easily into tiny droplets. This forms an emulsion known as *hydrous lanolin*, or *lanolin USP* (see EMULSION). Hydrous lanolin is widely used in medicines such as salves and ointments, and in cosmetics, because it is easily absorbed by the skin. Lanolin is also used as a dressing for leather goods, as a protective coating for metals, and as a base in grease paints and shoe polishes. GEORGE L. BUSH

LANSDOWNE, *LANZ down*, **MARQUIS OF** (1845-1927), HENRY CHARLES KEITH PETTY-FITZMAURICE, served as governor-general of Canada from 1883 to 1888. During his administration, the Canadian Pacific Railway was completed. The problems of his term included the Saskatchewan, or Riel, Rebellion (see RIEL, LOUIS). Later, Lansdowne served as Viceroy of India and held posts in the British cabinet. As Secretary of State for Foreign Affairs, he helped negotiate the agreements with Japan in 1902 and with France in 1904. Lansdowne was born in London. LUCIEN BRAULT

Lord Lansdowne

Brown Bros.



LANSING, Mich. (pop. 107,807; alt. 830 ft.), is the capital of the state and an important automobile-manufacturing city. It lies at the meeting place of the Grand and Red Cedar rivers in the south-central part of Lower Michigan. The 14-square-mile city is about 85 miles northwest of Detroit and 65 miles southeast of Grand Rapids (see MICHIGAN [map]).

Leavenworth

The Olds Building in Lansing, Mich., was named for Ransom Eli Olds, pioneer automobile inventor and manufacturer.

Over 150 industries operate in Lansing. The chief products include automobiles, trucks, farm tools, and gas engines. Lansing also acts as a trading center for the surrounding rich farm lands. Railway, bus, truck, and airlines serve the city. Four radio stations and two television stations broadcast from Lansing. The city publishes one daily newspaper.

Students may attend over 30 public schools and several private ones in Lansing. The Michigan School for the Blind and the Michigan Vocational School also are there. East Lansing serves as the home of Michigan State University of Agriculture and Applied Science, the first state school to offer agricultural courses for credit. The State Library and the State Historical Museum are in Lansing, and the city also has a public library.

Settlers first came to the site of Lansing in 1837. The legislature chose Lansing to succeed Detroit as the state capital in 1847. It received its city charter 12 years later, in 1859. Workers completed the white sandstone Capitol in 1878. It covers an area of four city blocks near the city's business section. A mayor and a council head the executive and legislative branches of Lansing's city government. WILLIS F. DUNBAR

LANSING, ROBERT (1864-1928), served as Secretary of State under President Woodrow Wilson from 1915 to 1920. He dealt with the difficult problems resulting from World War I, and attended the Peace Conference at Versailles, France, as one of the five American delegates in 1919 (see Versailles, Treaty of).

As a specialist in international law, Lansing served as American counsel in disputes concerning the Alaskan boundary and the North Atlantic fisheries. He wrote several books on international law and on the Versailles peace negotiations.

Lansing was born at Watertown, N.Y., and studied at Amherst College. He began his legal practice in 1889 at Watertown, N.Y. Nelson M. Blake

LANTERN. See Architecture (Architectural Terms).

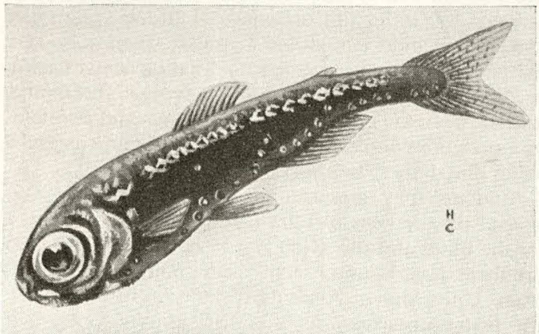
LANTERN is any light enclosed in a casing that protects it from wind and rain. The light from a lantern may be provided by electric batteries, carbide gas, gasoline, or kerosene. *Portable lanterns* may be carried from place to place. *Fixed lanterns* are used on ships and trains, and as warning signals at railroad crossings and street and highway obstructions. The *Japanese lanterns* are a special type for ornamental purposes. They are made of a globe of thin colored paper. The light is provided by a candle or electric-light bulb.

LANTERN, MAGIC. See Projection Machine.

LANTERN FISH has organs or glands that give off light. The organs look like little pearls. Some lantern fishes live in the deep sea. Others come to the surface at night. They have several series of the lighted organs on the sides of the head and body.

The *deep-sea anglers* also have a light-giving, or luminous, gland. They are not close relatives of the lantern fishes. An angler has a strange appearance, with an enormous head and a huge mouth armed with long sharp teeth. The luminous gland is at the tip of a stalk that rises from the end of the snout.

None of these fishes has any value for commerce, but zoologists find them of scientific interest.



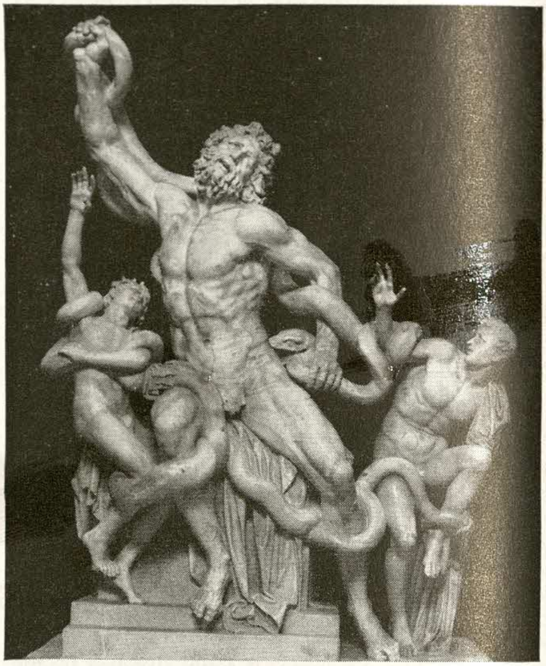
The Curious Lantern Fish Creates Its Own Light as it swims about the dark depths of the ocean.

Scientific Classification. The lantern fish is in the family *Myctophidae.* It is genus *Diaphus,* species *theta.* The deep-sea anglers are in the family *Ceratidae.* Leonard P. Schultz

LANTERN SLIDE. See Projection Machine.

LANTHANIDE. See Element, Chemical (table, Periodic Chart); Rare Earth.

LANTHANUM, *LAN thuh nuhm* (chemical symbol, La), is one of the rare-earth metals. It has an atomic number of 57 and an atomic weight of 138.92. The name comes from the Greek word *lanthano,* meaning *to be hidden* or *concealed.* The Swedish chemist Carl Mosander discovered lanthanum in 1839. It is found with other rare earths in monazite, bastnasite, and other minerals. It is always found among the fission products of uranium, thorium, and plutonium. It is separated from the other rare earths by fractional crystallization. This soft metal melts at about 1,685°F., and boils at about 8,100°F. Lanthanum is used in misch metal to make important metal alloys. The oxide is used in camera lenses. See also Element, Chemical; Rare Earth. Frank H. Spedding



This Laocoön Group Is in the Vatican at Rome.

LAOCOÖN, *lay AHK oh on,* a priest of Apollo, warned the Trojans against the Greeks at Troy. The Trojans and the Greeks had been at war for 10 years. Pretending to give up the siege, the Greeks left a huge wooden horse outside the gates of Troy. Laocoön suspected treachery, and told the Trojans not to take the horse inside the city walls. "I fear the Greeks, even when bringing gifts," he said.

Later, as Laocoön worshiped, two sea serpents attacked him and his sons and crushed them to death. Believing this to be a punishment from the gods, the Trojans rejected Laocoön's warning and took the wooden horse into the city. Laocoön had been right. The horse concealed Greek soldiers who came out of the horse during the night, and captured the city. Virgil describes the death of Laocoön in the second book of the *Aeneid.* Joseph Fontenrose

See also Trojan Horse.

LAODICEA, *lay AHD uh SEE uh,* was the name of several cities whose remains are in present-day Turkey, Syria, Iraq, and Iran. One city of this name, important in Hellenistic and Roman times, is now the seaport of Latakia, Syria (see Latakia). Another, a city of wealth and culture and a center of early Christianity, is represented by ruins located in southwestern Turkey, near Denizli. Waldo H. Dubberstein

LAOMEDON. See Priam.

LAOS, *LAH ohz,* or *LAH ohs,* is a mountainous country in southeastern Asia. The *map* shows that it lies between Vietnam and Thailand. China is to the north, and Cambodia to the south. Laos covers 91,450 square miles. The administrative capital is Vientiane (pop. 100,000); the royal capital, Luang Prabang (25,000).

The People and Their Work. Laos has a population of about 1,690,000. The people fall into three groups: (1) the Thai, (2) Indonesians, and (3) mountain dwellers of Chinese origin. The largest group is the Thai, who are Buddhists. Most Laotians are farmers who live in small villages. About a fourth of the people dwell in the mountains. The rest live along the Mekong River and its branches. Cities that lie along the Mekong include Pakse (pop. 25,000), Khong (pop. 10,000), Khong Sedone (pop. 10,000), and Pak Lay (pop. 10,000). Mountain cities include Saravane (pop. 25,000), Muong Hou Nua (pop. 10,000), Muong Sing (pop. 10,000), and Phong Saly (pop. 10,000).

Transportation. The French built and operate Seno Airport, near Vientiane. The country has few roads. The Mekong River is the most important waterway.

Education. More than 77,000 pupils attend the 770 primary schools in Laos. About 10 other schools provide secondary education for around 2,000 students. About 30 of every 100 Laotians can read and write.

Government. Laos is a constitutional monarchy. The king acts as the head of state and supreme religious leader. He appoints the prime minister, who is aided by a council of ministers. The national assembly is the legislative body. The people elect the 59 members of the assembly every five years.

History. About A.D. 1350, a strong ruler united Laos as the *Kingdom of Lan Xan,* or *Land of a Million Elephants.* For about 200 years, this kingdom ruled most of what is now Laos and northern Thailand. But wars with neighboring kingdoms later weakened the Laotian dynasty. Invaders from Thailand took parts of the kingdom during the 1800's. French forces stepped in during the 1890's and saved the kingdom from complete destruction. France established a protectorate over Laos in 1893, and governed it as part of French Indochina, which included Vietnam and Cambodia.

Independence movements developed in Laos after World War II. The country adopted its first constitution in 1947, and became an independent country within the French Union in 1949. Meanwhile, communist Vietminh forces had attacked the French in Vietnam. In 1953, the communists also invaded Laos.

FACTS IN BRIEF

Form of Government: Constitutional monarchy.

Capital: Vientiane (adm.); Luang Prabang (royal).

Official Language: Lao.

Area: 91,450 square miles. *Greatest length,* 650 miles. *Greatest width,* 315 miles.

Population: 1,690,000. *Density,* 18 persons to the sq. mi.

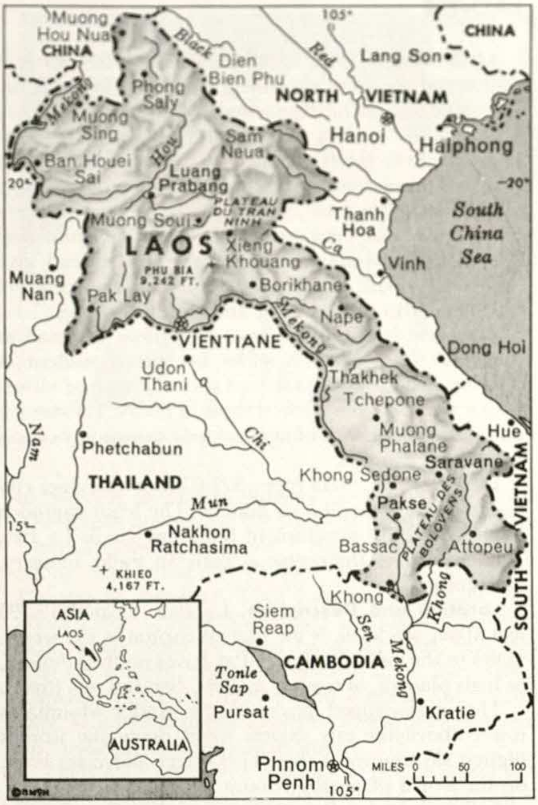
Chief Products: Benzoin, cardamom, cattle, cinchona, citrus fruits, coffee, leather goods, maize, opium, pottery, rice, silk, silverwork, tea, teak, tobacco.

Flag: A three-headed elephant, symbolizing Laos as the "Land of a Million Elephants," stands on a red field. See FLAG (color picture, Flags of Asia).

National Anthem: "Phing Sad Lao" ("Lao National Anthem").

National Holiday: Independence Day, July 19.

Money: *Basic unit,* Kip. For its value in dollars, see MONEY (table, Values).



The communists won a decisive victory at Dien Bien Phu, in Vietnam, in 1954. This led to a peace conference at Geneva, Switzerland, in 1954. It was attended by representatives from the United States, Great Britain, Russia, Communist China, France, Vietnam, Laos, Cambodia, and the Vietminh. They agreed to communist control of North Vietnam, and French control of South Vietnam. They also established Laos and Cambodia as neutral nations, or "buffer" areas, separating communist and pro-Western countries. Laos and Cambodia were forbidden to allow foreign military bases on their soil. Since that time, the United States has financed, equipped, and trained the Laotian army. King Sisavang Vong died in 1959, and was succeeded by his son, Savang Vathana.

On Aug. 9, 1960, Captain Kong Le of the Laotian army overthrew the anticommunist government. A neutralist government was organized with both communist and pro-Western members. Civil war broke out in September between neutralist and pro-Western factions. The northern half of Laos fell to the communists before the International Control Commission for Laos reported a cease-fire on May 12, 1961. Later, 14 nations opened the Geneva Conference on Laos, in Switzerland. In June the three political leaders, Prince Boun Oum (pro-Western), Prince Souvanna Phouma (neutralist), and Prince Souphanouvong (procommunist) agreed that the king should appoint a provisional government for Laos. THOMAS E. ENNIS

See also COLOMBO PLAN; INDOCHINA; SOUTHEAST ASIA; VIENTIANE; VIETNAM.

LAO-TSE, *lou dzuh,* or **LAO-TZU** (604?-531 B.C.), is considered the founder of the Taoist religion in China. His name means *Old Master* and, according to tradition, he wrote the *Tao Te Ching*. *Tao* means *the way*. This classic seeks to teach man how to live in harmony with the great impersonal power that controls the universe. It says that man must imitate the universe, which endures because it does not live for itself. He must stop struggling for wealth and prestige, and instead give himself in service to others. Then he will find peace of mind and will enjoy a long and fruitful life.

Tradition has it that Lao-tse served as librarian at the court of Chou. There he became a student of Chinese history, and practiced the true way of virtue. When the kingdom showed signs of decay, Lao-tse left and was never heard of again. CLIFTON E. OLMSTEAD

See also TAOISTS.

LA PAZ, *lah PAHS* (pop. 321,073), is the chief city and the actual capital of Bolivia. The legal capital is Sucre. But most government buildings are in La Paz. The city is also the center of Bolivian trade, industry, and culture.

Location and Description. La Paz, located 12,795 feet above sea level, is the highest capital in the world. It lies in the valley of the La Paz River on the *altiplano*, or high plateau, of western Bolivia. See BOLIVIA (map).

The snow-capped peaks of the Andes Mountains tower above the city. Skiers speed down the world's highest ski run, more than 17,000 feet above sea level, on the slopes of nearby Mount Chacaltaya.

Activities in La Paz center around a square called the Plaza Murillo. The National Palace, the Congress Building, and a cathedral surround the Plaza. Many narrow, cobbled streets wind up the sides of the valley. The city has many churches, some dating from the 1500's. Educational institutions include the University of San Andrés and the American Institute.

Industry and Trade. Factories in and around La Paz produce such products as beer, canned foods, cigarettes, cement, glass, and textiles.

History. Spanish colonists led by Alonso de Mendoza founded La Paz in 1548. They named it *La Ciudad de Nuestra Señora de La Paz*, or *The City of Our Lady of Peace*. In 1827, the city took the name of *La Paz de Ayacucho*, or *The Peace of Ayacucho*. This name commemorates the 1824 Battle of Ayacucho which ended Spanish control in Peru and Bolivia. Sucre is the *official* capital of Bolivia, but La Paz became the *actual* capital in 1898. All government offices except the Supreme Court moved from Sucre to La Paz, which provides better transportation to other parts of Bolivia. In 1955, an international railway linked the city with both coasts of South America. HAROLD OSBORNE

LA PÉROUSE, COMTE DE. See EXPLORATION AND DISCOVERY (table, Famous Explorers).

LAPHAM, INCREASE ALLEN. See WISCONSIN (Famous Wisconsinites).

LAPIDARY, *LAP ih DEHR ih,* is a craftsman who cuts, polishes, and engraves gems. The word *lapidary* comes from the Latin word *lapis*, meaning *stone*. Lapidaries flourished in Assyria, Babylonia, and Egypt more than 6,000 years ago. Lapidaries used a sapphire point in cutting until about 3000 B.C., when the Assyrians and Babylonians introduced the bow drill. Modern gem cutters use a lathe with a point or disk of soft iron, coated with diamond dust and oil. Before the 1300's, most gems were cut *en cabochon*. That is, they were polished smooth and closely retained the original size and color of the stone. The practice of cutting flat surfaces, or *facets*, is fairly modern. WILLIAM M. MILLIKEN

See also DIAMOND; GEM.

LAPILLI. See VOLCANO (Products of Volcanic Eruption).

LAPIS LAZULI, *LAP is LAZ yu lye,* is a beautiful azure-blue mineral whose color makes it valuable as an ornament. The mineral is sometimes called *lazurite*. Lapis lazuli consists chiefly of aluminum, sodium, silica, and sulfur. The mineral occurs in masses of fine grains and in crystals. Most of these deposits are in beds of limestone. Lapis lazuli sometimes is flecked with brilliant, shining spots. These spots are pyrite, an iron sulfide, and they help to identify genuine lapis lazuli.

The Egyptians used this mineral in their jewelry. So did the Romans, who called it "sapphire," a name now confused with a more valuable jewel. Lapis lazuli was once the only source of ultramarine, a blue pigment used in artists' paints (see ULTRAMARINE). This pigment is now made chiefly by chemical methods.

Ancient peoples believed that this mineral had medicinal value. They ground lapis lazuli stones to a powder, which they mixed with milk. The mixture was used as a dressing for boils and ulcers. The best specimens of lapis lazuli come from Afghanistan. Paler stones are found in Siberia and Chile. FREDERICK H. POUGH

LAPITH. See CENTAUR.

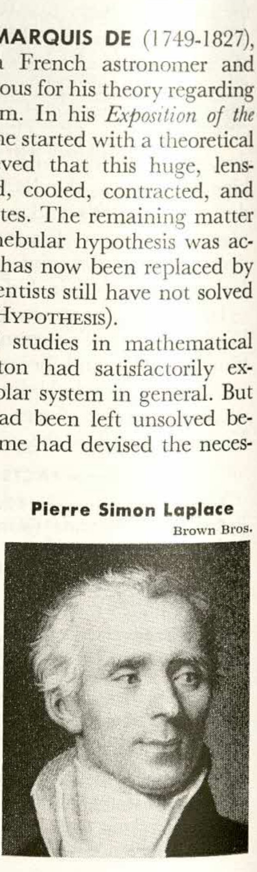
LAPLACE, *lah PLAHS,* **MARQUIS DE** (1749-1827), PIERRE SIMON LAPLACE, a French astronomer and mathematician, became famous for his theory regarding the origin of the solar system. In his *Exposition of the System of the Universe* (1796), he started with a theoretical primitive nebula. He believed that this huge, lens-shaped cloud of gas rotated, cooled, contracted, and threw off planets and satellites. The remaining matter formed the sun. Laplace's nebular hypothesis was accepted for a long time, but has now been replaced by other theories. However, scientists still have not solved the problem (see NEBULAR HYPOTHESIS).

Laplace also contributed studies in mathematical astronomy. Sir Isaac Newton had satisfactorily explained movements of the solar system in general. But certain difficult problems had been left unsolved because no one in Newton's time had devised the necessary mathematical tools. Laplace accounted for the intricacies in the movements of the heavenly bodies. In his master work *Celestial Mechanics* (1798-1825), he summed up the achievements in theoretical astronomy from the time of Newton.

Laplace was born at Beaumont-en-Auge, France, the son of a farmer. He became a professor of mathematics in Paris at the age of 20. EDWARD ROSEN

Pierre Simon Laplace

Brown Bros.



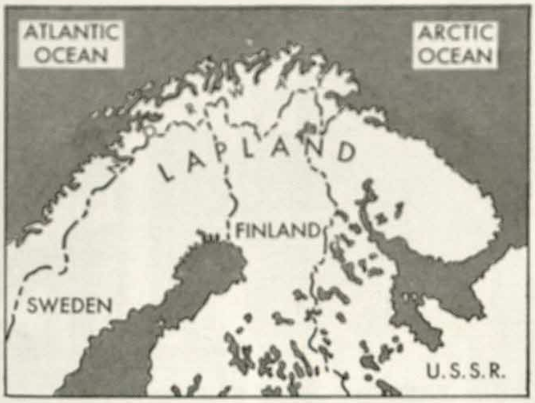
LAPLAND, *LAP land,* lies in the extreme northern part of Europe, above the Arctic Circle. The region is called Lapland because it is the home of a small, sturdy people known as the Lapps. But it does not form a separate country. The region that makes up Lapland belongs to Norway, Sweden, Finland, and Russia.

Lapland has a cold climate. Winter lasts nine months every year. The other three months resemble spring in areas that have mild climates. Because Lapland lies so far north, it has a period of two months in summer when the sky never darkens. The sun never rises above the horizon for two months each winter.

Location and Size. Lapland covers about 150,000 square miles. It stretches across the northern parts of Norway, Sweden, Finland, and Russia. The region includes all of northern Norway; the Swedish province of Norrbotten and part of Norrland; all of northern Finland; and the Kola Peninsula of Russia. For location, see EUROPE (color map). Lapland has no definite boundary to the south. The Arctic Ocean borders it on the north. The White Sea washes its eastern coasts, and the Norwegian Sea lies to the west.

The Land and Its Resources. Lapland is a bleak, barren region with few trees and thin, stunted vegetation. Of the trees, only birches, pines, and firs manage to survive. But they are only midget trees, kept small by the cold climate. Plant life consists primarily of mosses and lichens. Many reindeer feed on the scanty vegetation. Some wander wild, but the people herd many reindeer like cattle. The reindeer provide an important source of food, and also serve as draft and pack animals.

Iron and nickel provide the most valuable mineral resources. Beds of iron lie deep under the soil of southern Swedish Lapland. The nickel deposits are in the Russian part of the region. Lapland's iron deposits rank among the largest in the world. The iron mines at Gällivare, Kiruna, and Malmberget are some of the world's richest. A railroad links the iron fields with Lulea, on the Gulf of Bothnia, and another connects with Narvik, Norway. The railroads carry iron ore to these ports for export to other countries.



Lapland Lies Far in the North of Europe.

The People. Lapland has a population of about 30,000. About 2,000 of the people live in Finland, 7,000 in Sweden, 20,000 in Norway, and 1,000 in Russia. The Lapps are among the smallest peoples of Europe. They average only about 5 feet in height, but are strong and muscular. Lapps look somewhat like Chinese or Japanese. They have low foreheads, high cheekbones, straight black hair, and slightly yellowish skin. Their noses are often broad and flat, and their lips are straight and thin. Some Lapps live outside Lapland, in central Sweden and Finland and in Norway. Many have married Swedes, Finns, or Norwegians, and their physical type is changing.

The Lapps are mostly a nomadic people who follow reindeer herds. But many have settled in fishing or farming villages. They dress in clothes made of wool and reindeer skins. Their everyday garments are so colorful that they resemble holiday costumes. The Lapps are healthy and happy, although they must work hard to live in their bleak land.

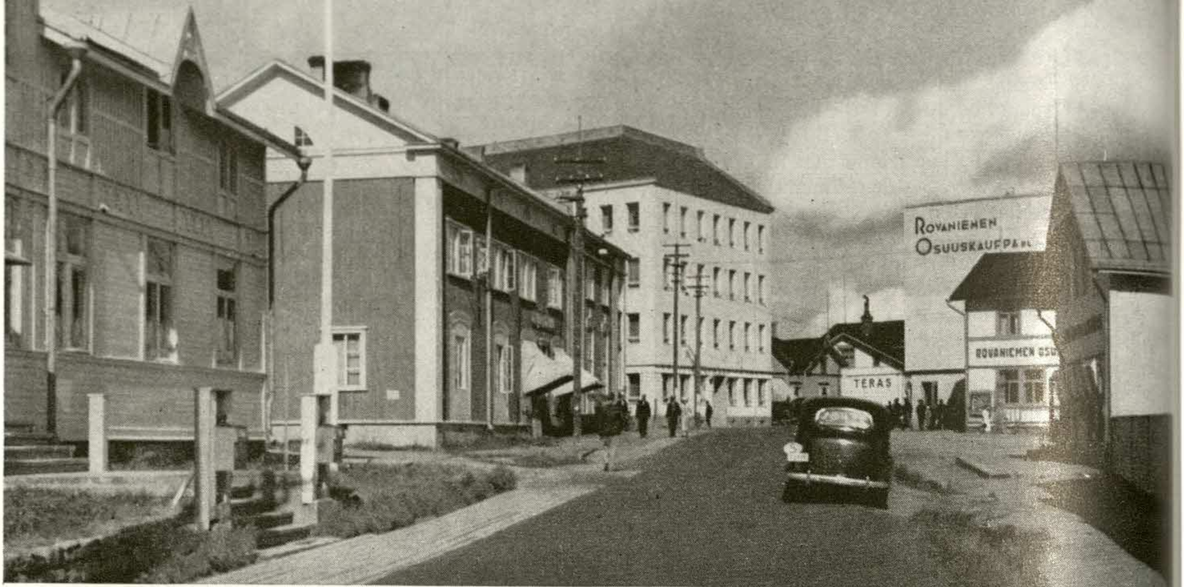
Language and Religion. The language of Lapland is related to that spoken in Finland. The people in various sections speak sharply different dialects. Many Lapps have no formal education, because there are few schools.

All Lapps once believed in a form of magic called *shamanism*. The *shaman*, or medicine man, beat drums to foretell the future (see SHAMAN). Today, most Lapps

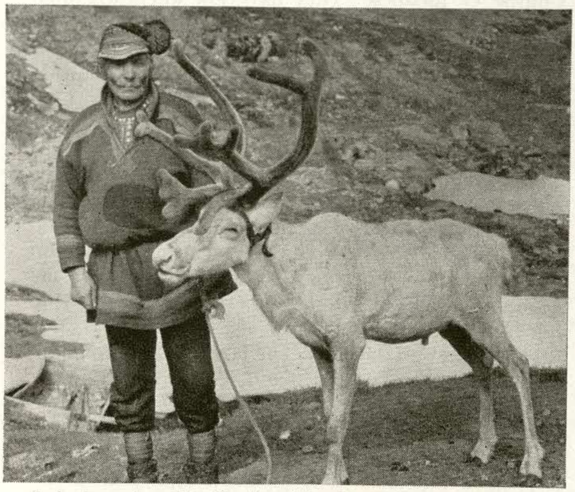
Lapp School Children live in these wooden pyramid huts near the school. Many students come from far away to attend school.

A Lapp Schoolboy draws water from a well in the cold and snowy north country, where winter lasts nine months each year.

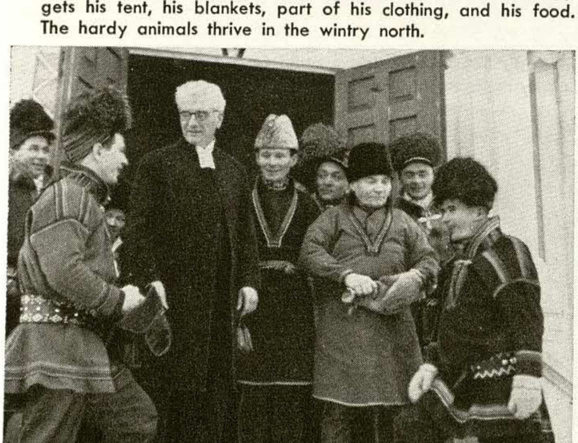
Van Hansen, Black Star



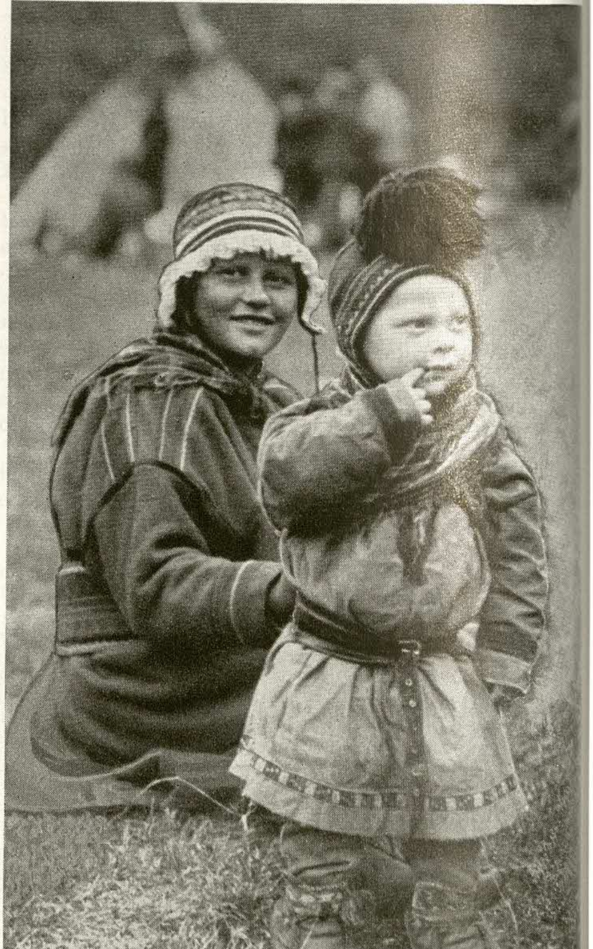
Rovaniemi Is the Chief City of Finnish Lapland. This modern town of the Far North is located almost directly on the line of the Arctic Circle. The main street shown is part of the great Arctic highway that leads to the Barents Sea.



Reindeer Are the Cattle of Lapland. From them this Lapp gets his tent, his blankets, part of his clothing, and his food. The hardy animals thrive in the wintry north.



Lapps in Their Holiday Costumes greet the pastor as they leave a church service during the winter market festival.



Sawders; Burton Holmes; Ewing Galloway; Pix

A Lapp Mother and Child living at a camp near Lyngseidet, Norway, watch arriving tourists with happy interest.

belong to the Lutheran or Eastern Orthodox churches. The people often have trouble attending church because they live so far away. But they will cross vast distances to attend church when they are to be married or wish to bury their dead.

Work of the People. The Lapps may be grouped according to their primary means of livelihood. These groups are: (1) the Mountain Lapps, (2) the Sea Lapps, and (3) the River Lapps.

Mountain Lapps live a wandering life. They move from one place to another with their herds of reindeer. These nomads pitch their tents wherever there is enough vegetation to feed the herds. An entire family lives in a single cone-shaped tent, shared by the family dogs. The Mountain Lapps live chiefly on reindeer meat, milk, and cheese.

Sea Lapps live along the coast in huts made of wood and covered with sod. They work primarily as fishermen. The Sea Lapps are more civilized than the Mountain Lapps. They often build their huts in groups that shelter communities of fishermen.

River Lapps live in settlements along the river banks. They are the most progressive people in Lapland. They have a kind of community life, and occasionally do a little farming. The River Lapps fish and hunt, and keep herds of reindeer, cattle, and sheep.

History. Anthropologists believe that the Lapps moved to Lapland from central Asia thousands of years ago. Finnish merchants began to trade with the Lapps in the 1300's. Swedish kings held the title "King of the Lapps" in the 1500's and 1600's. But the people have always lived about the same way as they do today, with only loose community organization and little government control. John H. Wuorinen

See also Clothing (color picture, Europe).

LA PLATA, *la PLAH tah* (pop. 207,031; met. area 275,000; alt. 40 ft.), is a city 35 miles southeast of Buenos Aires, Argentina, on the great estuary called the Río de la Plata. For location, see Argentina (map).

La Plata is the capital of the province of Buenos Aires. It is also an important cattle and grain port, with meat-packing, cold-storage, and oil-refining plants. In 1951, the city was named Eva Perón in honor of the wife of President Juan D. Perón. When the Perón government fell in 1955, the name again became La Plata. George I. Blanksten

LA PLATA, RÍO DE. See Río de la Plata.

LAPP. See Lapland; Races of Man (picture, Europe).

LAPPING. See Grinding and Polishing.

LAPWING is a crested plover that lives in Western Europe and the British Isles (see Plover). The lapwing's name comes from the awkward way it flaps its wings as it flies. The bird is also called a *peewit* because of its shrill, wailing cry. The lapwing has a bronze-green back, and blue-black throat and breast. When the lapwing's nest is threatened, it limps and pretends to be hurt, and lures its enemies away.

Scientific Classification. The lapwing belongs to the family *Charadriidae*. It is classified as genus *Vanellus*, species *vanellus*. Alfred M. Bailey

LARACHE, *lah RAHSH* (pop. 41,898; alt. 35 ft.), is a seaport on the northern Atlantic coast of Morocco (see Morocco [color map]). It serves as an important fishing and agricultural center. Larache is well known for its oranges, which it exports along with other fruits, cereals, hides, and wool. The city was founded in the 800's near the ancient ruins of Lixus, a Phoenician and Roman colony. It served as a haven for pirates between the 1300's and the 1800's. Spain ruled Larache during most of the 1600's. It then came under a sultan. Spain reoccupied Larache in 1912, and ruled it until Morocco became free in 1956. James S. Coleman

LARAMIDE REVOLUTION. See Geology (table, Outline of Earth History).

LARAMIE, *LAR uh mih* (pop. 17,520; alt. 7,165 ft.), the third largest city of Wyoming, lies on the Laramie Plains about 50 miles west of Cheyenne (see Wyoming [map]). The Laramie River flows past the city.

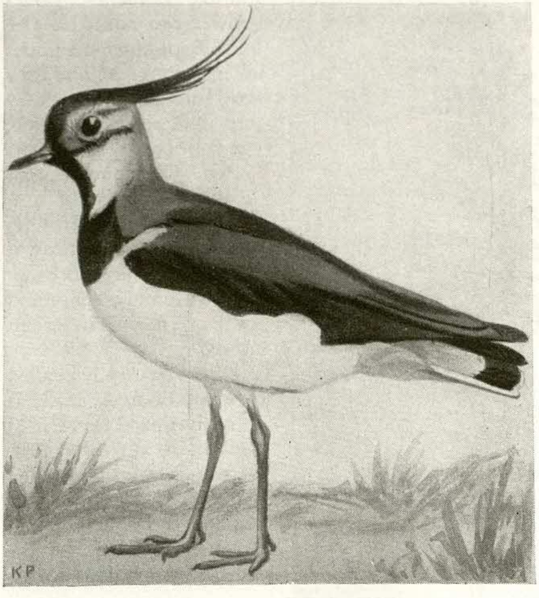
Laramie, the county seat of Albany County, has a council-manager form of government. Tourists enjoy sightseeing and trout fishing in the Medicine Bow Mountains 30 miles west of the city. The University of Wyoming, in the eastern section of the city, provides Laramie residents with their chief source of income. The Union Pacific Railroad is the second largest employer.

The city serves as a transportation center for a large cattle- and sheep-raising region. Manufactures include cement, lumbering, and bricks and tiles. Municipal Airport is near the city.

Laramie, named for Jacques Laramie, an American trapper, was founded in 1868, when the tracks of the Union Pacific reached the city. T. A. Larson

LARAMIE, JACQUES (? -1821), an American fur trapper, explored southeastern Wyoming and became the first white man to visit certain sections of that area.

While trapping in the Colorado region about 1818, Laramie entered southeastern Wyoming. In 1820, he built a cabin on the river which he explored and which



The Lapwing's Crest Rises to a Pointed Peak above its head. The bird is not a graceful flier, but it cleverly lures enemies away from its nest by pretending to be injured. ▶

was named for him. Although little is known of him, many geographical features and places in Wyoming bear his name. Among these are the Laramie Mountains, Laramie Park, Laramie County, and the city of Laramie.

Laramie was probably born in Canada of French parentage or descent. His name was possibly more correctly spelled *Lorimier*. It may also have been spelled *La Ramée*.

William P. Brandon

LARBOARD is a nautical term which indicates the left side of a ship to a person facing the bow.

LARCENY, *LAHR suh nih*, is the crime of stealing a person's property. Generally, larceny is divided into two classes, *grand* and *petit* (pronounced *petty*). When a criminal takes money or property worth more than $50, the crime is usually called *grand larceny*. But the laws of some states set the amount at a smaller figure than $50. If a criminal takes anything of less value than $50, he commits *petit larceny*.

Grand larceny generally is punished by imprisonment for a year or more. The penalty for petit larceny is usually a jail sentence of less than one year. As late as 1827, some forms of larceny in Great Britain could be punished by death.

Fred E. Inbau

See also Burglary; Embezzlement; Robbery.

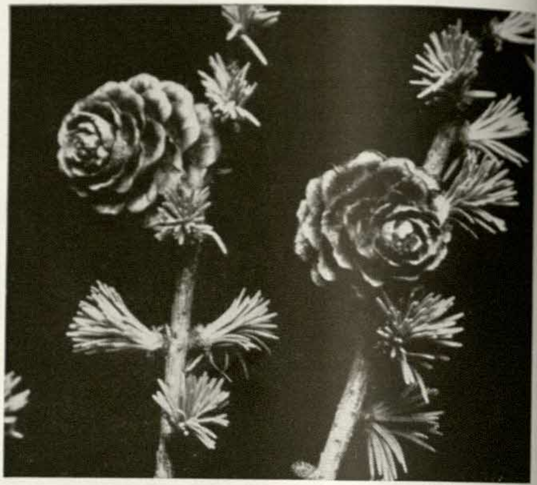
LARCH is a tree that belongs to the pine family. Unlike most trees that have needlelike leaves, larches shed their needles every fall and go through the winter "naked." Such trees are called *deciduous*. Most other trees of the pine family are *evergreens* (see Tree [The Needle-Leaf Trees]).

The Tall, Slender Larch is easy to recognize. It produces a durable timber.

U.S. Forest Service

Larches grow throughout the Northern Hemisphere. Three species are native to the United States. It is easy to recognize larches by their needles, which grow in clusters on spurlike branches. Cones grow from some of the buds. Ripe cones are about an inch long. At first they are a bright red. Then they turn dark red. When ripe, they become chestnut brown. The cone remains on the trees after the needles have fallen off. Larches are commonly planted as ornamental trees because of their attractive shape and their open, yellow-green crowns.

Eastern larch, often called *tamarack* or *hackmatack*, is a medium-sized tree, reaching heights up to 60 feet. Its branches form a narrow pyramid. It grows from Canada through the eastern United States, as far south as Pennsylvania and west to Illinois. The eastern larch is not important commercially, but its wood is sometimes used as poles. The American Indians used its tough roots to bind their canoes.



Rutherford Platt

Tufts of Needles on the Larch resemble those of pine trees, but larch trees shed each year. The flowers are reddish-brown.

Western larch is a large tree, growing up to 150 feet tall. It grows extensively in Oregon, Washington, Idaho, Montana, and British Columbia, and is commercially important for its lumber. Its wood closely resembles that of the Douglas fir. The western larch has an orange-red, scaly bark, and open crowns of light green foliage.

European larch, another important timber species, has been widely planted in the eastern United States. The *subalpine larch* is a rare, small, timberline tree. It thrives in the western United States and Canada.

Scientific Classification. Larches are in the pine family, *Pinaceae*. They make up the genus *Larix*. The eastern larch is genus *Larix*, species *laricina*. The western larch is *L. occidentalis*.

Richard Preston, Jr.

See also Cone-Bearing Trees; Deciduous Tree; Evergreen; Pine.

LARD is obtained by refining the fat of hogs. The fat is *rendered*, or melted, and strained to remove any bits of flesh or tissue. The lard is then allowed to cool in containers, or in firm white blocks that are later cut into squares, or bricks, and packaged to be sold in grocery stores.

The finest lard comes from the fat around the kidneys of the hog. This *leaf* lard is the best lard to use for cooking. When it is fresh, good lard has a mild flavor and a pleasant odor. It is light and almost crumbly in texture when first rendered. Modern developments have produced a lard of bland flavor and odor that does not become rancid or sour at ordinary room temperatures.

Lard from other parts of the hog is usually broken up into three glycerin compounds: olein, palmitin, and stearin. Most lard contains 62 parts of olein to 38 parts of the other two compounds.

Olein is an oily substance used as a lubricant. *Palmitin* is used to make soap and candles. *Stearin* is used in the manufacture of soap, ointments, and some kinds of margarine (see Stearin).

Leone Rutledge Carroll

Ring Lardner

LARDNER, "RING," RINGGOLD WILMER (1885-1933), won fame as a sports reporter and as an author of humorous short stories. His stories about baseball players with muscles stronger than their brains include *Alibi Ike* and *My Roomy*. These tales are full of understanding as well as satire. Lardner became well-known in 1914 for *You Know Me Al*, a series of sketches about a pitcher who fails in the major leagues. In collections such as *The Love Nest and Other Stories* (1926) and *Round Up* (1929), he widened his subject matter to include all ranks of society.

Lardner also wrote plays and poetry. *Elmer the Great* (1928), written with George M. Cohan, enjoyed more success as a motion picture than as a play. But *June Moon*, written with George S. Kaufman, became a Broadway hit in 1929. His verse appears in *Bib Ballads* (1915) and *Regular Fellows I Have Met* (1919).

Lardner was born in Niles, Mich. He began working as a reporter for the *South Bend* (Ind.) *Times*, then became a sports reporter for newspapers in Chicago, Boston, and St. Louis. From 1913 to 1919, he conducted a well-known sports column in the *Chicago Tribune* called "In the Wake of the News." HERBERT R. BROWN

LAREDO, *luh RAY doh*, Tex. (pop. 60,678; alt. 440 ft.), on the Pan American Highway, is the chief port of entry on the United States-Mexico border. An international bridge links it with its sister city, Nuevo Laredo, in Mexico. Laredo lies on the Rio Grande along the southern edge of the state (see TEXAS [map]). It serves as a market for the fruits and vegetables raised on nearby farms. It also ships cattle, refines oil, and manufactures hats and other products. It is the home of the Laredo Air Force Base.

Founded by a group of Spaniards in 1755, Laredo boasts of being the oldest independent city in the state of Texas. Laredo has a mayor-council form of city government. H. BAILEY CARROLL

LARES, *LAY reez*, **AND PENATES,** *pee NAY teez*, were gods and spirits of the home and hearth in Roman mythology. To the Romans, the words *lares* and *penates* came to mean the same as *house* or *home*. In each Roman household, the family worshiped its own lar, to protect the home from outside damage. In later times, households included two lares. Each family also worshiped its own two penates, to protect the interior of the home, its storehouse, and the family table. At every meal, the family offered part of its food to these gods. Safety and success, the family believed, depended upon their faithfulness to these family gods and spirits.

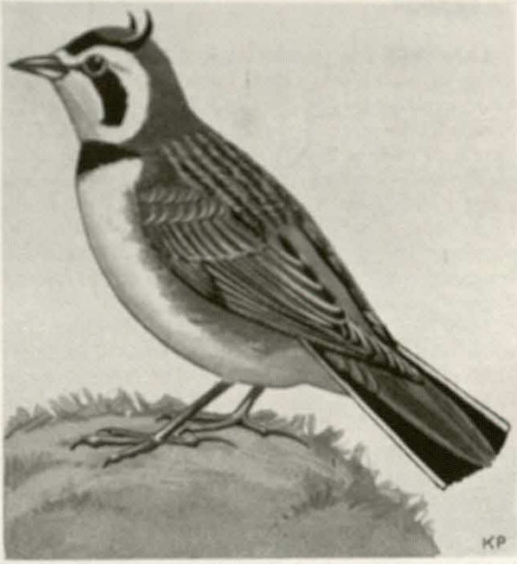
Ancient Roman cities also had lares and penates, as if each city was a big family. Vesta, the goddess of the hearth in home, city, and state, was associated with the lares and penates (see VESTA). O. M. PEARL

LARGHETTO. See MUSIC (Terms).

LARGO. See MUSIC (Terms).

LARIAT. See COWBOY (His Rope).

LARISSA. See THESSALY.



The Horned Lark of the United States and Mexico has two tufts of feathers which curve upward from its head.

LARK is any one of a group of birds found chiefly in the Eastern Hemisphere. Perhaps the best known of the larks is the *skylark*, which nests throughout Europe and in temperate regions of Asia. It grows about 7 inches long. Its sandy brown coat has dark brown streaks. Each hind toe has a long, straight claw.

The skylark usually builds its nest on the ground in the open field. It may use grass, hair, bits of cloth, rags, or sticks as building material. The female lays four or five dull-gray eggs marked with olive brown. Larks raise two broods a season. Skylarks have been introduced into North America, but have survived only on Vancouver Island, British Columbia.

The skylark is famous for its flight song. People often hear the song when the bird is out of sight in the sky. The English poet, Percy Bysshe Shelley, wrote one of his finest poems, "Ode to a Skylark," about this song. One of William Shakespeare's famous songs begins "Hark! Hark! the lark at Heaven's gate sings." A famous painting by Jules Adolphe Breton shows a farm woman who stopped her work to listen to the skylark's song (see BRETON, JULES ADOLPHE [picture]).

The *horned lark* lives in the Northern Hemisphere. It breeds throughout most of Canada and the United States. The horned lark grows about 7½ inches long. It has pinkish or grayish-brown plumage. Dark feathers grow in small tufts that look like horns above and behind the bird's eyes.

During the breeding season, the males soar high, and, like skylarks, pour out their simple songs. At other times they sing while on the ground. The well-known *meadow lark* is not classified as a true lark. It is related to blackbirds and orioles (see MEADOW LARK).

Scientific Classification. Larks make up the family *Alaudidae*. The skylark is genus *Alauda*, species *arvensis*. The horned lark is *Eremophila alpestris*. GEORGE J. WALLACE

See also LIFE (table, Length of Life [Skylark]).

LARK BUNTING. See BIRD (table, State Birds; color picture, Other Bird Favorites); BUNTING.

LARKSPUR is a popular name for the *delphinium*, a group of flowers that belong to the buttercup family. Gardeners usually give the name *larkspur* to the annual flowers in this group or the wild woodland species. The perennial garden flowers are called *delphinium*. Larkspur grows in the cool regions of both hemispheres. The name comes from a curved, spurlike growth on the upper sepal of each flower. The other five sepals grow together. The petals are also uneven in form. The leaves are finely divided, and the lobes spread like the fingers on a hand.

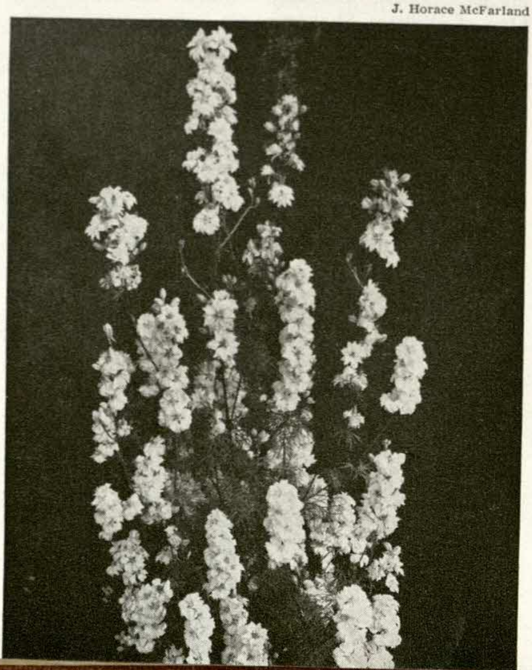
There are about a hundred kinds of larkspur. The smallest grow about a foot high, and some of the larger kinds may be 5 or even 7 feet tall. The flowers may be blue, white, or pink. Some kinds of larkspur are poisonous to cattle and there have been cases of larkspur poisoning on western ranges. Sheep are almost immune to the poison, and horses are only slightly affected. A European larkspur is used in medicine.

Many kinds of larkspur have been cultivated as ornamental plants. Most of them grow best in the North. They are easy to grow because they do not require any particular soil or care. They do best in the open where they can get plenty of air. Most of them are planted as seeds in the autumn or the early spring. They bloom in summer, with many stately spikes of flowers suitable for cutting. Others are grown by *division*, or from cuttings made from young shoots in the spring.

Larkspur may be troubled by a disease called sclerotium rot, which makes the leaves yellow and wilts the plant. The disease can be fought by removing the infected plant, and by replacing the earth for about 1½ feet around the plant. Planting new seeds in a different location will help check the blight.

Scientific Classification. The larkspur is in the family *Ranunculaceae*. It is genus *Delphinium*. Robert W. Schery

See also Flower (color picture, Summer Garden Flowers [Delphinium]).



The Larkspur is a popular garden plant because it does not require special care. The plant grows best in northern areas.

J. Horace McFarland

L'ARLÉSIENNE. See Bizet, Georges.

LA ROCHEFOUCAULD, *la rush foo KOH,* **DUC DE** (1613-1680), François de La Rochefoucauld, a French moralist, became famous for his *Maxims* (1665). These are reflections on men and their conduct and motives. The author's disillusionment with life shows in the pessimistic and cynical tone of the comments. He hoped that the cynicism would provoke men into becoming nobler. La Rochefoucauld was born in Paris and became a professional soldier. He fought with bravery in the civil war of 1648. But his side lost, and he was left impoverished by the struggle. F. J. Crowley

LA ROCHELLE (pop. 49,000; alt. 66 ft.) is France's leading fishing port on the Atlantic Ocean. See France (color map). It also serves as a major communications center for the North Atlantic Treaty Organization. Following the Edict of Nantes in 1598, La Rochelle passed from royal to Protestant control. It was one of the most important fortified cities granted to the Protestants as guarantees of religious freedom. Cardinal Richelieu demanded the return of the fortified cities to royal control in 1627. La Rochelle withstood a siege by the royal army for 14 months, but finally was starved into submission. Edward W. Fox

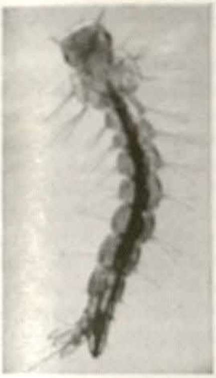
LARREINAGA, *LAHR ray ee NAH gah,* **MIGUEL** (1771-1847), a jurist and a leader of the Central American independence movement, revised the civil code of Guatemala. In 1814, he represented Central America in Spain at a conference on colonial problems. Later he attended a conference called by Emperor Agustín de Iturbide of Mexico. In 1839, he presided at the National Constitutional Assembly of the United Provinces of Central America.

Larreinaga was born in León, Nicaragua, and was educated in Guatemala City. He taught school in Nicaragua and Guatemala. Donald E. Worcester

LARVA, *LAHR vuh,* is an active, immature stage of an animal. It differs noticeably from the adult stage in such characteristics as structure, behavior, food habits, and environment. The development of an animal through egg, larval, and sometimes pupal stages to the adult is called *metamorphosis*.

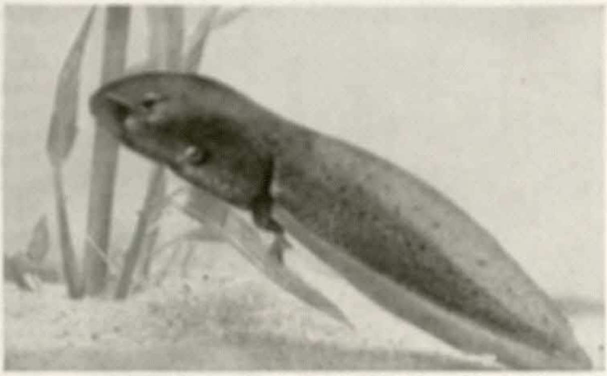
Larvae occur in the metamorphoses of many groups of animals. They are especially common in the insects and in animals that live in the water. The larva of the sponge is a tiny, oval creature that swims about by means of short, hairlike *cilia*. Eventually, it settles down, attaches itself to a solid object, and develops into an almost immobile, plantlike adult sponge. Parasitic flukes, tapeworms, and roundworms usually have one or two larval stages. The larvae are parasitic on different animals.

Marine annelid worms have larvae called *trochophores* that swim about by means of cilia. Many mollusks, including clams, oysters, scallops, snails, and periwinkles, have a free swimming larva called a *veliger*. Some of them also have another larval stage, a trochophore similar to that of the annelids. The larvae of fresh-water mussels, called *glochidia*, fasten themselves to the gills or skin of fishes and ride about on them. Then they drop off, settle down, and burrow in the bottom. Many crustaceans, including lobsters and crabs, have active, free-swimming, large-eyed larvae. Barnacles have two distinct larval stages, called *nauplii* and *cyprids*. These larvae swim and drift great distances before



The Larva of the Mosquito looks transparent.

The Larva of the Blowfly is like a small worm.



USDA, Bureau of Entomology and Plant Quarantine; L. W. Brownell

The Tadpole of the Bullfrog is a well-known larva. It is often called a *polliwog*. The legs have started to grow on this little animal.

The Larva of the Lacewing has many hairy spines.

Cornelia Clarke; USDA, Bureau of Entomology and Plant Quarantine

The Larva of the Useful Silkworm is what we usually call a caterpillar. Silk for cloth is made from the fibers of the cocoon it spins. Unlike many larvae, it is extremely useful to man.

fastening themselves to solid objects and becoming adults. The larvae of many water animals are important food for fishes. They float about as part of the *plankton*, or mass of small, drifting animal and plant life (see PLANKTON).

Most insects have larvae more or less distinct from the adults. Larvae that change directly to the adult stage are often called *naiads* if they belong to water insects. If they belong to land insects, they are called *nymphs*. The *caterpillar* of a moth or butterfly, the *grub* of a beetle, and the *maggot* of a fly are all larvae.

Among the vertebrates, or animals with backbones, many fishes have distinct larvae. For example, eels have ribbon-shaped transparent larvae. Frogs and toads, which are amphibians, have larvae called *tadpoles* or *polliwogs*.

ALEXANDER B. KLOTS

Related Articles in WORLD BOOK include:

Bee
Caterpillar
Fly
Frog
Grub
Hellgrammite
Leaf Miner
Metamorphosis
Moth

LARYNGITIS, *LAR in JYE tihs,* is an inflammation of the tissues of the larynx, or voice box. It may be caused by various conditions. Sometimes germs invade the tissues and cause them to become inflamed. Doctors believe that laryngitis may result from the use of irritating materials, such as tobacco and alcohol. Breathing irritating substances may also cause inflammation. Improper use of the voice, which puts extra strain on the larynx and vocal cords, may often cause laryngitis.

When the inflammation begins, the tissues of the larynx swell. Soon the patient becomes hoarse. If the condition continues, the person may lose his voice temporarily because the vocal cords become thick and cannot vibrate to produce sound. Most cases of laryngitis should be treated by a physician.

ALBERT P. SELTZER

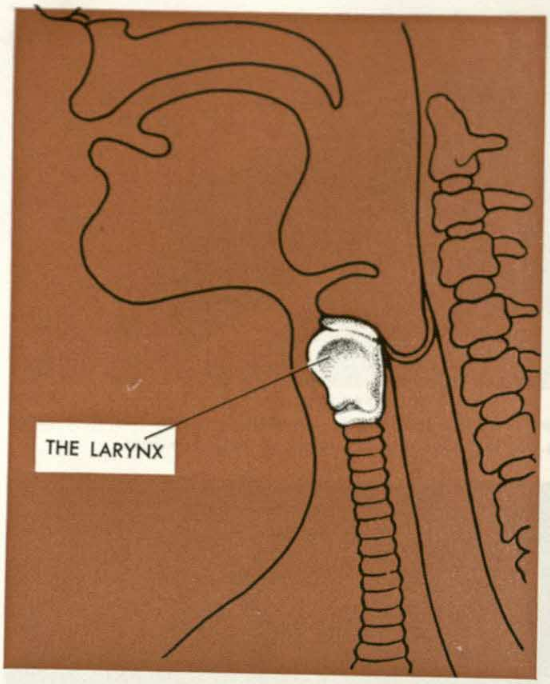
See also LARYNX.

LARYNGOSCOPE. See GARCÍA (Manuel).

LARYNX, *LAR inks,* is a section of the air passage in the throat, located between the back of the tongue and the *trachea*, or windpipe. It forms the front of the lower part of the pharynx. The larynx is sometimes called the *voice box*, because the vocal cords are in its upper part. Every breath of air that passes in and out of the lungs passes through the larynx.

The larynx is shaped like a box and consists of nine sections of cartilage. The most important are the thyroid and cricoid cartilage.

The *thyroid cartilage* is made up of two wing-shaped



The Larynx Contains the Vocal Cords with which we speak. As air from the lungs passes the two bands of tissue inside the larynx chamber, the vocal cords vibrate like the strings of a musical instrument and make the speaking sounds.

plates that meet in front to form the projection called the *Adam's apple*. These plates make up the side walls of the larynx.

The *cricoid cartilage* is shaped like a signet ring. Its broad side forms the back wall of the larynx. The two *arytenoid cartilages* rest on the back of the cricoid cartilage. The *true vocal chords*, two bands of elastic tissue, stretch between the arytenoid cartilages and the inner front wall of the thyroid cartilage. The *glottis* is an opening between the true vocal cords, together with the other parts of the larynx concerned with voice production. The sounds produced in talking or singing occur when the true vocal cords vibrate as air rushes through the voice box. Above and parallel to the vocal cords are other folds of membrane. These are called the *false vocal cords* because they have nothing to do with voice production. ANDREW CONWAY IVY

See also the Trans-Vision three-dimensional color picture with HUMAN BODY; also ADAM'S APPLE; LARYNGITIS; VOICE.

LA SALLE, JEAN. See JEAN BAPTISTE DE LA SALLE, SAINT.

LA SALLE, SIEUR DE (1643-1687), ROBERT CAVELIER, was a French explorer whose ambition was to colonize and civilize the Mississippi Valley. He did not live to see his dreams come true, but he blazed a trail for later settlers and explorers.

La Salle was born in Rouen, France, of a wealthy family. At the age of 23 he went to Canada, where he intended to become a fur trader. He bought a piece of land eight miles from Montreal and built a trading post. He did much of his trading with Indians, and the tales that they told aroused his interest in the unexplored regions to the southwest. He was particularly interested in a tale of a great river which the Indians called the Ohio, and which flowed south to the sea. La Salle thought that the Ohio River was probably the long-sought route to the Pacific Ocean, so in 1669 he sold his land and started on a trip to explore the Ohio.

First Explorations. La Salle joined a company of missionaries bound for the upper Great Lakes, but soon left the party and went southward with a few followers. It is reported that he discovered the Ohio River and went down as far as the rapids of Louisville. He continued to explore the region for the next two or three years. He traveled along Lake Michigan, crossed to its western shore, and explored the valley of the Illinois River.

In 1674, on the recommendation of Count Frontenac, Governor of Canada, La Salle was granted honors at the French court. He also received a tract of land which included Fort Frontenac, on the site of the present city of Kingston, Ont. La Salle would have become wealthy if he had remained on his land, but he wanted to explore the rich country of Illinois.

In 1678 La Salle returned to France and laid his plans before the French court. Many of his requests were granted, but only on the condition that they would not cost the French government anything. La Salle returned to Canada and had a ship built. In 1679 this ship, the *Griffin*, sailed to the Straits of Mackinac, but was lost on the return voyage.

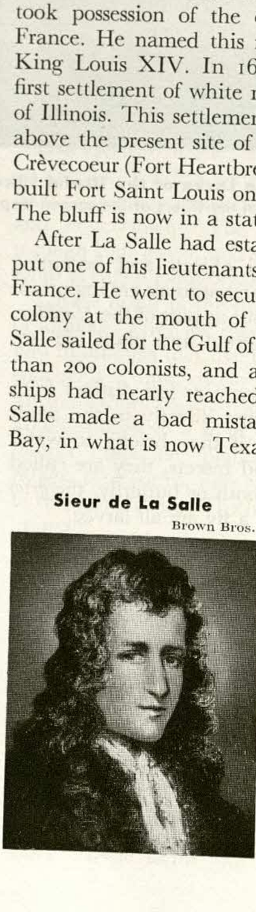
Explores Mississippi. During the next three years, La Salle traveled down the Mississippi to its mouth and took possession of the entire Mississippi Valley for France. He named this region Louisiana in honor of King Louis XIV. In 1680, La Salle established the first settlement of white men in what is now the state of Illinois. This settlement stood on the Illinois River above the present site of Peoria, and was named Fort Crèvecoeur (Fort Heartbreak). Two years later La Salle built Fort Saint Louis on a bluff in the Illinois River. The bluff is now in a state park, called Starved Rock.

After La Salle had established Fort Saint Louis, he put one of his lieutenants in charge and again left for France. He went to secure supplies and settlers for a colony at the mouth of the Mississippi. In 1684 La Salle sailed for the Gulf of Mexico with four ships, more than 200 colonists, and a large store of supplies. The ships had nearly reached their destination when La Salle made a bad mistake. He mistook Matagorda Bay, in what is now Texas, for the mouth of the Mississippi. There had been some disagreements between the captain of the ship and La Salle, and the captain was anxious to put to sea again. Without realizing the mistake, he left after La Salle and his party had landed. La Salle set out on foot for Canada. But one of the explorer's followers shot him during their journey northward. FRANKLIN L. FORD

See also IBERVILLE, SIEUR D'.

Sieur de La Salle

Brown Bros.



LA SALLE COLLEGE is a liberal arts school for men at Philadelphia, Pa. It is conducted by the Roman Catholic Brothers of the Christian Schools. Courses lead to bachelor's and master's degrees in religious education. There are schools of arts and sciences, and business administration. La Salle was founded in 1863. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LA SCALA, in Italian, TEATRO ALLA SCALA, in Milan, is the leading opera house of Italy. It stands on the site of the Church of Santa Maria della Scala, and was built between 1776 and 1778, with the consent of Empress Maria Theresa of Austria. The auditorium holds more than 3,000 persons. SCOTT GOLDTHWAITE

See also MILAN (picture).

LAS CASAS, *lahs KAH sahs,* **BARTOLOMÉ DE** (1474-1566), was an early Spanish missionary to America. He arrived in 1502 with the newly appointed Spanish governor of the island of Hispaniola. Las Casas became a Roman Catholic priest in 1510, and later joined the Dominican order. He was the first priest ordained in America. He protested vigorously against the enslavement of the Indians on Hispaniola, and worked to help them. In 1547, Las Casas returned to Spain. He was born in Seville. JAMES A. CORBETT and FULTON J. SHEEN

LASCAUX CAVE. See CAVE (picture); PAINTING (color picture, *The Left Wall of the Hall of the Bulls*).

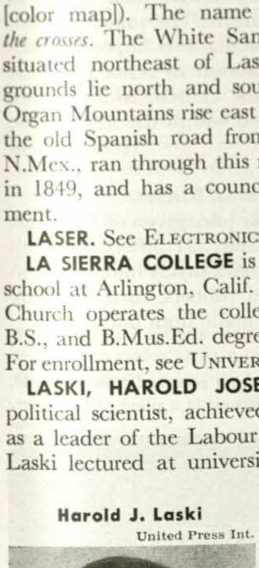
LAS CRUCES, *lahs KROO ses,* N.Mex. (pop. 29,367; alt. 3,885 ft.), is the trading center for the rich farm lands of the Mesilla Valley. The city lies on the Rio Grande in south-central New Mexico (see NEW MEXICO [color map]). The name *Las Cruces* is Spanish for *the crosses*. The White Sands National Monument is situated northeast of Las Cruces. Military proving grounds lie north and south of the monument. The Organ Mountains rise east of the city. *El Camino Real*, the old Spanish road from Chihuahua to Santa Fe, N.Mex., ran through this region. The city was settled in 1849, and has a council-manager form of government. FRANK D. REEVE

LASER. See ELECTRONICS (Recent Developments).

LA SIERRA COLLEGE is a coeducational liberal arts school at Arlington, Calif. The Seventh-day Adventist Church operates the college. La Sierra grants A.B., B.S., and B.Mus.Ed. degrees. It was founded in 1922. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LASKI, HAROLD JOSEPH (1893-1950), a British political scientist, achieved fame as an educator and as a leader of the Labour party. From 1914 to 1920, Laski lectured at universities in Canada and in the United States, including McGill and Harvard. He taught political science at the University of London between 1926 and 1950. Laski served on the executive committee of the Labour party from 1936 to 1949, and was chairman for one year. His books include *The American Presidency* (1940) and *The American Democracy* (1948). Laski was born in Manchester, and attended Oxford. ALFRED F. HAVIGHURST

Harold J. Laski
United Press Int.



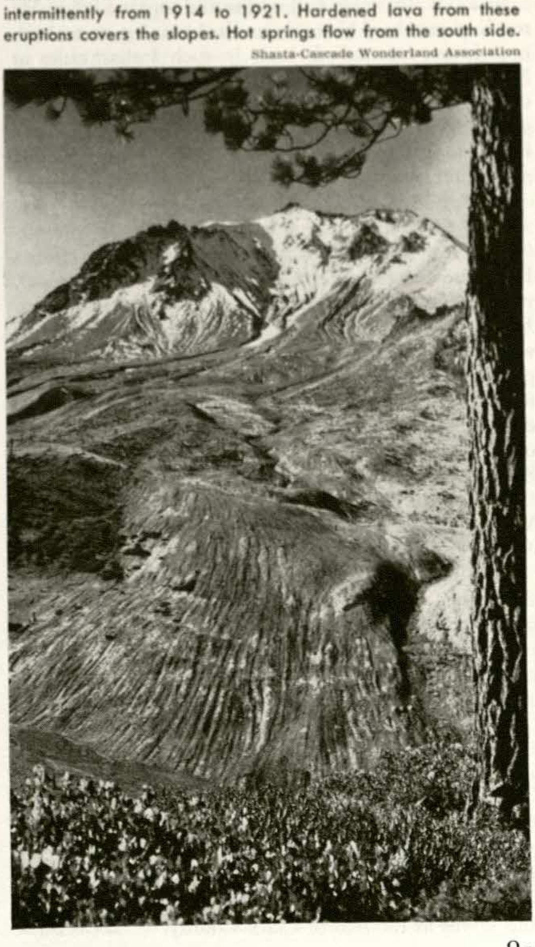
LAS PALMAS, *lahs PAHL mahs* (pop. 132,120; alt. 43 ft.), is the chief port of the Canary Islands, and the capital of the Spanish province of Las Palmas (see SPAIN [map]). Its beaches and mild climate make it a popular resort. See also CANARY ISLANDS.

LASSEN PEAK (10,466 feet) is the only active volcano in the continental United States outside Alaska. It is in northeastern California, near the southern end of the Cascade Mountains. Lassen Volcanic National Park lies around the volcano. The peak was named for Peter Lassen, who blazed one of the early trails of California across its slopes. The volcano was inactive for many years after it was discovered. On May 30, 1914, Lassen Peak erupted and sent up a shower of mud, dust, stones, and fine sand. Several other eruptions occurred afterwards, the last in February, 1921. PAUL R. HANNA

LASSEN VOLCANIC NATIONAL PARK covers 105,922 acres in northeastern California. Lassen Peak (10,466 feet), the only active volcano in the continental United States outside of Alaska, is in this park. The park was established in 1916.

Lassen Peak Highway cuts north and south across the park. The highway goes near the Chaos region. Here, hundreds of steep domes of lava that were pushed up

Lassen Peak in Lassen Volcanic National Park erupted intermittently from 1914 to 1921. Hardened lava from these eruptions covers the slopes. Hot springs flow from the south side.
Shasta-Cascade Wonderland Association



from below the earth's surface form the odd-looking formations called Chaos Crags and Chaos Jumbles.

More than 40 glacier-made lakes are in the park. Reflection Lake mirrors Lassen Peak. Three large lakes called the Chain-of-Lakes lie in the eastern part of the park. Hot springs bubble on the surface of Boiling Spring Lake in the park.

The park is a preserve for many wild animals, including squirrels, deer, hummingbirds, owls, and eagles. More than 20 kinds of trees grow in the park. They include pine, cedar, fir, and hemlock. PAUL R. HANNA

See also LASSEN PEAK.

LASSO. See COWBOY (His Rope).

LASSO, ORLANDO DI (1532?-1594), is considered the greatest of the early Netherlands' composers. His work represents the high point in the development of Dutch *polyphony*, or many-voiced music. He produced more than 2,000 compositions, most of which are vocal music. They include secular madrigals and chansons, as well as religious masses and motets. The madrigal, the most refined form of secular music, influenced the motet and the mass. The style of Di Lasso is less melodious and more harmonic than most music of his day, and his work is considered more dramatic than that of his contemporary, Giovanni Palestrina.

As a boy, Di Lasso had a beautiful soprano voice. He received much of his early musical training as a choirboy. Later, he studied music in such Italian cities as Milan and Naples. In 1556, Di Lasso went to Munich, Germany, where he served as a court musician and gained favor with the nobility. He was born ROLAND DE LASSUS in Mons, Belgium, and was also known by the name ORLANDUS LASSUS. WARREN S. FREEMAN

LAST. See SHOE (Making Shoes).

LAST FRONTIER. See ALASKA.

LAST OF THE MOHICANS is the second of James Fenimore Cooper's *Leather-Stocking Tales*. The novel, published in 1826, tells part of the story of Natty Bumppo. Except for *The Spy*, it was the first American novel to win a world-wide audience. It is still perhaps the supreme example of the drama of flight and escape in fiction. Its characters include Chingachgook, an Indian. The action takes place largely in the forests of upper New York during the French and Indian Wars. See also COOPER, JAMES FENIMORE. EDWARD WAGENKNECHT

LAST SUPPER. See JESUS CHRIST (The Passion); DA VINCI, LEONARDO; PAINTING (color picture, *The Last Supper*, by Tintoretto).

LAS VEGAS, *lahs VAYgus* (pop. 64,405; alt. 2,030 ft.), the largest city in Nevada, has become noted for its gambling casinos and night clubs. They stand on Fremont Street and a two-mile stretch just outside the city, called *The Strip*. Tourists can stay at about 300 hotels and motels in the area.

Las Vegas lies in the southeastern corner of the state. For location, see NEVADA (color map). It serves as a shipping center for a mining and ranching area.

Las Vegas was founded in 1905 as a division point on the present-day Union Pacific Railroad. It received its city charter in 1911, and became a boom town during the construction of nearby Hoover Dam in the 1930's. Las Vegas has a mayor-council form of government, and serves as the seat of Clark County. LUCIUS BEEBE

LATAKIA, *LAT uh KEE uh* (pop. 48,984; alt. 250 ft.) is Syria's only important seaport. It lies about 110 miles north of Beirut, Lebanon (see SYRIA [map]). In the late 1940's, Syria began a program to improve the harbor and make it useful for large ships. The city has given its name to the famous tobacco it exports.

LATEEN SAILS. See SHIP AND SHIPPING (Ships of Trade).

LATENT HEAT. See HEAT (Changes); STEAM.

LATERAL LINE. See FISH (Sense Organs).

LATERAN, *LAT er un*, is the cathedral church of the pope, the bishop of Rome. It is also called Saint John Lateran, and ranks higher than any other Roman Catholic church in the world. It stands on the site of the palace of Plautius Lateranus, from which the church takes its name. The emperor Nero seized the palace, and a later emperor, Constantine the Great, gave it to the church. Pope Sylvester I built the first church on the site in 324. An earthquake destroyed it in 894. The second and third structures burned down. In 1362, Pope Urban V built the fourth church erected on the site. It has undergone several architectural changes since that time.

The Lateran palace stands next to the church. Five general councils, known as the Lateran Councils, have been held there. In 1215, the Fourth Council ordered the publication of banns of marriage (see BANNS OF MARRIAGE). The palace served as the residence of the popes during the Middle Ages, until their court was transferred to Avignon, France. After their return to Rome, they lived at the Vatican. The present palace was built about 1580. It contains two important museums which the Italian government restored to the popes in 1871, along with the church. Many popes, including Leo XIII, lie buried within the walls of the Lateran. FULTON J. SHEEN

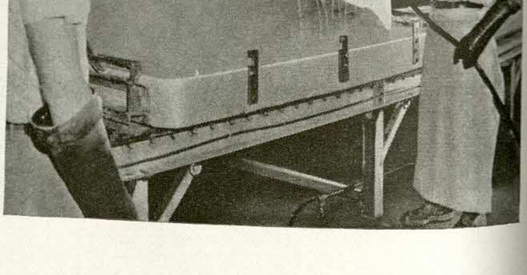
See also POPE.

LATERAN TREATY. See PAPAL STATES.

LATEX, *LAY tex*, is the milky juice given off by plants and trees of the sapodilla family. It differs from sap because it flows between the bark layers rather than in the wood. Certain gums and rubbers, used in many manufacturing processes, are made from latex.

A Foamed-Latex Mattress is being removed from the mold. It is still steaming from the curing process in a plant at Fall River.

Firestone



The hevea and guayule trees and the milkweed plant produce *rubber latex*, used to make articles ranging from rubber balls to *lastex*, a vulcanized-rubber yarn. The balata and the gutta tree give off latex used to make balata and gutta-percha gums. The naseberry, or sapodilla tree, produces *chicle latex*. Manufacturers use the tough, fragrant chicle in making chewing gum. See Chewing Gum.

Fresh latex is not stable. Preservatives must be added within three or four hours after collection to prevent bacterial decomposition or coagulation. From 0.6 to 1 per cent of ammonia is used. The preserved latex contains 38 to 40 per cent of solids. C. L. Mantell

See also Chicle; Colloid; Guayule; Rubber.

LATHAM, HUBERT. See Airplane (Pioneer Fliers).

LATHAM, JEAN LEE (1902-), an American writer for children and young people, received the Newbery medal in 1956 for her book *Carry On, Mr. Bowditch* (1955). Her other books include *Story of Eli Whitney* (1953), *Medals for Morse* (1954), *Trail Blazer of the Seas* (1956), *This Dear Bought Land* (1957), and *On Stage, Mr. Jefferson!* (1958).

During World War II, Miss Latham trained signal-corps inspectors for the U.S. Army. She was born in Buckhannon, W.Va., and studied at Cornell University. Charlemae Rollins

LATHE. See Engine Turning; Machine Tool; Woodworking Tool.

LATHROP, DOROTHY P. (1891-), an American artist and writer for children, won the first Caldecott Medal for *Animals of the Bible* in 1938. In creating her drawings of animals, Miss Lathrop worked from live models, and her household included many animal pets. Her books include *The Fairy Circus* (1931), *Little White Goat* (1933), *Lost Merry-Go-Round* (1934), *Who Goes There?* (1935), *The Colt from Moon Mountain* (1941), and *Let Them Live* (1951).

Miss Lathrop was born in Albany, N.Y., and studied at Teachers College of Columbia University, the Pennsylvania Academy of the Fine Arts, and the Art Students League in New York City. Ruth Hill Viguers

Dorothy P. Lathrop became known for her drawings of animals. This sketch shows a playful unicorn, a legendary animal with one horn on its forehead.

The Colt from Moon Mountain by Dorothy P. Lathrop, published by Macmillan Co.

Julia Clifford Lathrop

LATHROP, *LAY thrup,* **JULIA CLIFFORD** (1858-1932), was the first chief of the Children's Bureau of the United States Department of Labor. She became the first woman to head an important government bureau in the United States. A college friend of Jane Addams, she worked at Hull-House almost from its beginning, first as a county visitor and then as a member of the Illinois State Board of Charities (see Hull-House). She resigned from the board in 1901, in protest against a political appointment, but was reappointed by a new governor. She served 11 years, and took a leading part in the establishment of the first Juvenile Court.

President William Howard Taft called her to the Children's Bureau when it was formed in 1912, and she served as its chief until 1921. The Bureau owes its emphasis on qualified child-welfare workers and its emphasis on research to her. She encouraged the states to establish efficient birth registration and to prevent the unnecessary removal of children from their parents by providing aid to mothers. Julia Lathrop was born in Rockford, Ill. Alan Keith-Lucas

LATIFUNDIA. See Agriculture (Egypt and Rome).

LATIMER, HUGH (1485?-1555), was a martyr of the Protestant Reformation in England. Born at Thurcaston, England, he studied at Cambridge University and became a Roman Catholic priest. His refusal to condemn the views of Martin Luther concerning the church caused him to be called before Thomas Cardinal Wolsey in 1525 for investigation. But later he was named one of the clergymen who were to examine the legality of King Henry VIII's marriage with Catherine of Aragon. His support of Henry made him a favorite of the king, who named Latimer one of his chaplains. In 1535, Latimer became Protestant bishop of Worcester. But he resigned because he opposed the Six Articles, which he thought favored Roman Catholicism.

Later, the Roman Catholic Queen Mary had him arrested along with other Protestant churchmen. He was called before a church court and was condemned to be burned at the stake. On Oct. 16, 1555, Latimer and Nicholas Ridley were brought to their place of execution opposite Balliol College, Oxford University. It is said that Latimer exclaimed to his companion, "We shall this day light such a candle, by God's grace, in England, as I trust shall never be put out." His martyrdom caused widespread sympathy for all persecuted Protestants. George L. Mosse

Hugh Latimer

Brown Bros.

LATIN AMERICA

LATIN AMERICA is the name commonly used to refer to the 20 nations that extend from the southern border of the United States to Cape Horn at the southern tip of South America. Of these 20, seven are part of the North American continent, 3 are island nations in the Caribbean Sea, and 10 make up most of the continent of South America. The region is called Latin America because the Latin-based languages and cultures of Spain, Portugal, and France have influenced life in all these nations. Colonies of European powers are not usually considered a part of Latin America.

Most Latin Americans have pure or mixed Spanish, Portuguese, Indian, or Negro ancestry. The *mestizos*, or people of mixed white and Indian descent, form the largest population group. Spanish is the official language of all the countries except Brazil and Haiti. Brazilians speak Portuguese, and Haitians speak French. But, even though they are similar in many ways, each of the Latin-American nations has its own customs, history, and heroes. About three of every four Latin Americans are farmers. Most of them cultivate land owned by wealthy landlords, or work on large plantations and ranches. Most farmers raise only enough to feed themselves and their families. But the plantations and ranches export bananas, cocoa, coffee, meat, sugar, wheat, wool, and other products. Latin America also provides rich supplies of minerals, including bauxite, copper, emeralds, iron ore, lead, petroleum, silver, tin, tungsten, and zinc.

When Europeans conquered Latin America in the 1500's, some of the Indian civilizations were highly developed. The Aztec of Mexico, the Maya of Central America, and the Chibcha and Inca of South America lived in communities based on farming and ruled by organized governments. The Maya had advanced systems of astronomy and mathematics, and used a calendar more accurate than that of the Europeans. In the 1800's, the Latin-American colonies determined to free themselves of European control. Revolutions raged between 1791 and 1824, until nearly all the colonies had won their independence. Cuba remained under Spanish control until 1898, when it gained its freedom.

The new nations tried to establish democratic governments similar to that of the United States. But the Latin Americans had no experience in government, and did not understand democracy. Revolution, dictatorships, unfair elections, and army control soon became common throughout Latin America. By the mid-1900's, however, some Latin-American nations, including Brazil, Chile, Costa Rica, Mexico, and Uruguay, had developed much more democratic governments.

For more information on the development of Latin-American nations, see the separate articles on each country and the articles NORTH AMERICA; SOUTH AMERICA; CENTRAL AMERICA.

The Land

Latin America covers nearly 8,000,000 square miles. This is almost three times the size of the United States. Oceans and seas surround Latin America except for the 1,800-mile land border that separates the United States and Mexico.

Mountains cover most of Mexico, Central America, the West Indies, and western South America. A huge forest region in northern South America covers nearly half the continent. The Amazon River and its tributaries flow throughout this region. The Amazon is the longest river of Latin America and the second longest in the world. Rolling grasslands cover much of southeastern South America. They extend throughout northeastern Argentina, Uruguay, eastern Paraguay, and part of southern Brazil. The Río de la Plata system, which includes the Uruguay, Paraguay, and Paraná rivers, drains most of this area. A scrub forest region lies to the west and south of the grasslands. It extends from about the center of South America all the way to the extreme southern tip of the continent.

Climate

Latin America has three major types of climate: (1) the low latitude climate, (2) the middle latitude climate, and (3) the cold climate.

The Low Latitude Climate extends from Monterrey, Mexico, to Rio de Janeiro, Brazil, and includes the West Indies. Temperatures in this area vary little from season to season. It is always hot in the tropical lowlands, with temperatures averaging between 75°F. and 80°F. Most Latin Americans live in the cool highlands, where temperatures average about 65°F. In many places, they farm land that is less fertile than that in the humid, unhealthy lowlands.

The Middle Latitude Climate extends both north and south of the low latitudes. Northern Mexico, Uruguay, southern Brazil, and central Argentina and Chile lie in the middle latitudes and have a climate similar to that of Ohio, Wisconsin, and Iowa. The temperature averages about 25°F. in winter and about 70°F. in summer. Enormous farms, some worked by hundreds of tenant farmers, and vast ranches with thousands of cattle or sheep cover much of this region.

The Cold Climate ranges across southern Argentina and southern Chile. But temperatures do not fall so low as they do in the northern United States and Canada. They average about 32°F. in July, the coldest month, and about 50°F. in January, the warmest month. This region ranks among the most sparsely settled in Latin America. Ranchers graze sheep in parts of it, but much of the area is desert.

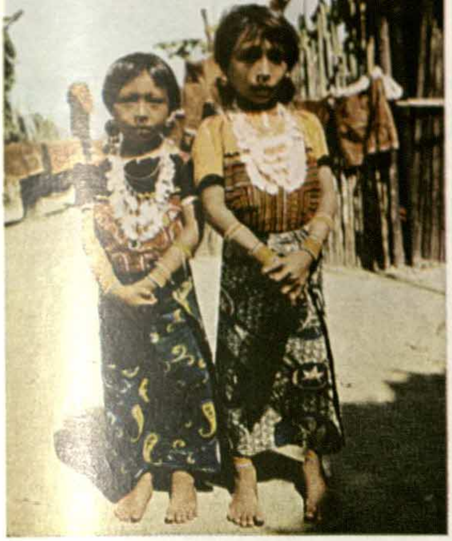
Rainfall varies by both regions and seasons. Heavy rains, totaling more than 80 inches a year, fall almost continuously in the Amazon Basin and in southern Chile. But a great desert, which stretches more than 1,000 miles from northern Peru to central Chile, has less than 2 inches of rain a year.

Life of the People

About 155,000,000 persons live in Latin America. No one knows the exact population of the region, because many Latin American countries take a census only once in a great while.

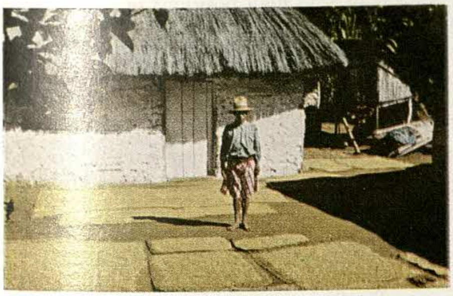
Indians make up the largest population group in Guatemala, Bolivia, Ecuador, and Peru. More than half the people of Guatemala have Indian ancestors, and about half the people of Bolivia, Ecuador, and Peru are of pure Indian descent. Latin America has a total Indian population of more than 20,000,000.

Mestizos are the descendants of Europeans who intermarried with the Indians. They make up the largest

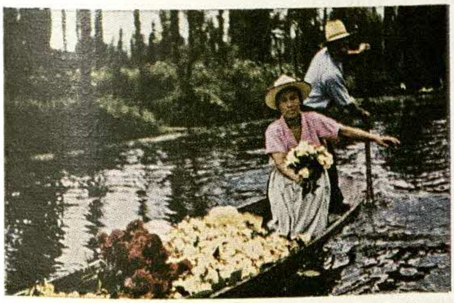


Dollars Often Are Ornaments in Panama. These Indian girls wear necklaces of United States coins, and use coconuts for money.

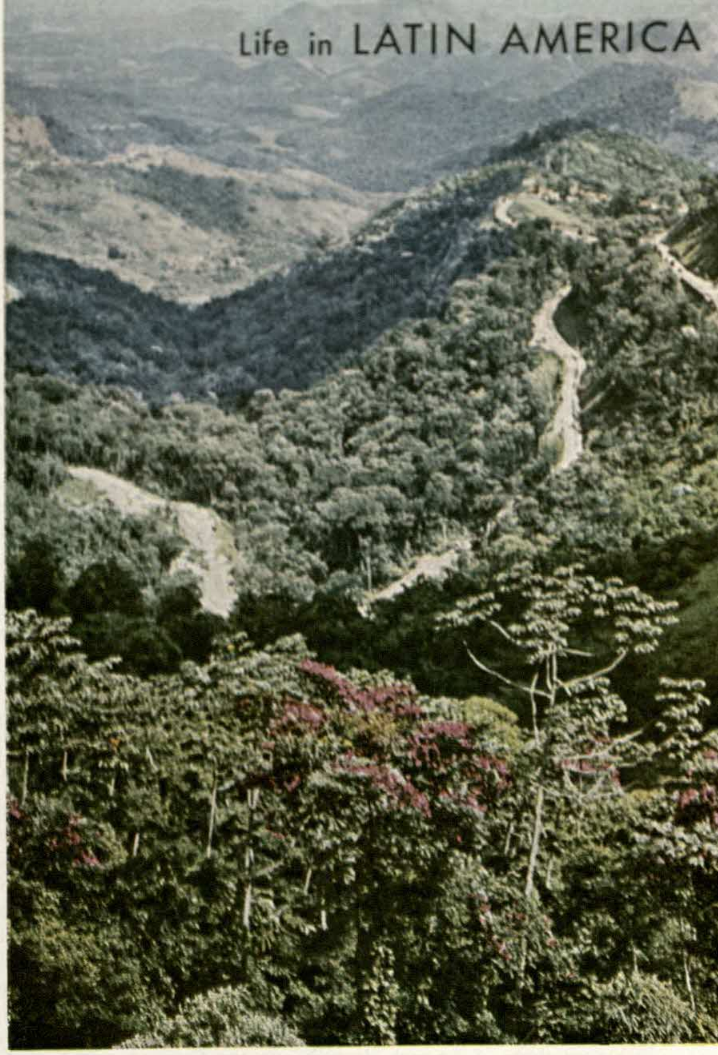
Gardens in Panama often are cultivated with *machetes*. A machete is a knife that is used for cutting, chopping, and sometimes digging.



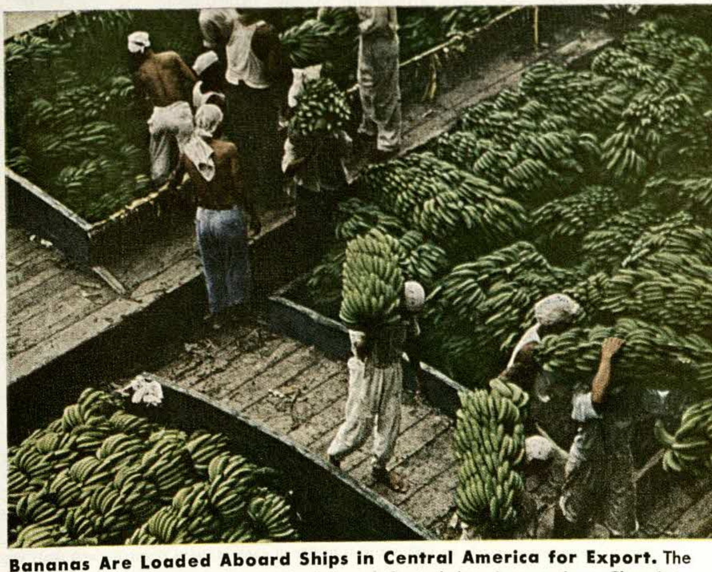
Coffee Beans Dry Outdoors in Guatemala. Coffee is the chief product of the country. It grows only in the cool southern highlands.



Floating Gardens of Xochimilco are in Mexico. Flowers bloom on floating islands held in place by plants that have taken root in the water.



The Highlands of Brazil Are Quite Mountainous. Motorists from Rio de Janeiro travel a twisting highway when they drive to Petropolis, a famous Brazilian summer resort. The highway rises 2,700 feet in the 45-mile trip.



Bananas Are Loaded Aboard Ships in Central America for Export. The fruit grows on the tropical coastal plains of Central American nations. Chocolate, coffee, and tobacco also grow in this region.

Ewing Galloway; Paul R. Hanna; John Strohm; Free Lance Photographers' Guild; Dumke; Publix; Three Lions

group in Honduras, Nicaragua, El Salvador, Colombia, Venezuela, Chile, Paraguay, and Mexico.

Whites make up most of the populations of Argentina, Uruguay, and Costa Rica. Most Argentines and Uruguayans are of Spanish or Italian descent. The majority of Costa Ricans have Spanish ancestors. About half the Brazilians are whites, chiefly of Portuguese, Italian, German, and Spanish descent. Small groups of Englishmen, Irishmen, Scots, Poles, Frenchmen, Scandinavians, Russians, Greeks, Yugoslavs, and others have settled throughout Latin America.

Negroes. Most Panamanians are Negroes, or have mixed Negro, white, and Indian ancestors. In Cuba, long a center of slave trade, about one fourth of the people are of Negro or part Negro descent. Haiti, a French possession for about 300 years, has a population made up chiefly of the descendants of Negro slaves. Many persons are of mixed French and Negro descent. Most of the people of the Dominican Republic have some Negro ancestors.

Language. Most Latin Americans speak Spanish or Portuguese, and some speak French. Many Indians speak only the languages of their tribes.

Spanish is the official language of 18 Latin-American republics. Spanish officials ruled much of Latin America for more than 300 years, and Spanish traders and settlers dominated the life of most of the countries.

Portuguese is the language of Brazil, which Portugal controlled from the 1500's to the 1800's. But many Indian and African words have enriched the Portuguese spoken there.

French serves as the official language of Haiti. But most Haitians mix French with Negro dialects. Many educated persons throughout Latin America speak French fluently as a second language.

Indian Languages and Dialects. Indians in Latin America speak between 100 and 200 dialects. So many people, including those of Spanish descent, use the Guaraní tongue in Paraguay that it is a nationally used language, along with Spanish. Paraguay is the only American nation with such a popular Indian language.

Way of Life. Latin Americans consider politeness an everyday part of life, and quickly notice its absence. Most of them are broad-minded about other people's opinions. But they greatly prize their personal dignity and resent personal criticism.

Most Latin-American families have five or six children. Family life is quite close, and most people take part in fewer activities outside the home than they do in the United States. Men enjoy much more freedom than do women. During the 1900's, however, women have received some of the privileges that were formerly granted only to men. For example, women can now vote in most Latin-American countries.

The manners and customs of the business and professional groups are based on those in Spain and Portugal. In business dealings, for instance, Latin Americans spend much time in friendly discussion. They find it hard to understand the speed with which business is conducted in the United States.

The upper and middle classes generally dislike physical labor. For example, a person who values his social reputation would seldom carry a suitcase in public. He would rarely, if ever, do odd jobs around the house or yard. Most middle- and upper-class families have servants to do these jobs.

The women in poorer families, including almost all Indians, cook, care for the children, and make many of the clothes. The father usually earns a living by farming, and the mother and children often help him in the fields.

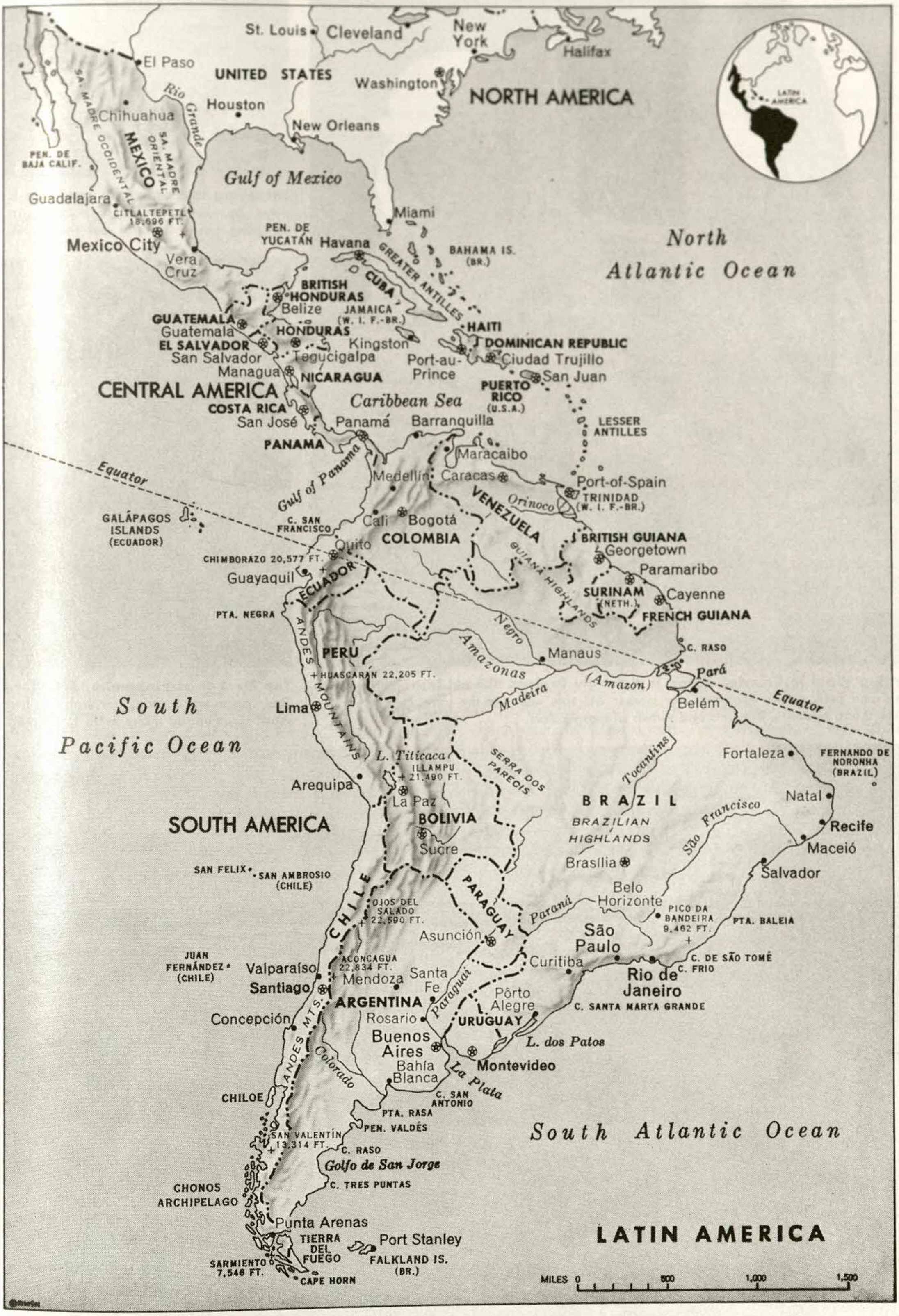
Millions of Indians have little or no contact with the activities of modern life. Some farm their own land, but most work for wealthy landowners. Their social life centers around local markets, where they exchange their products and visit with their friends. Nonwhites, especially Indians, usually must struggle harder than whites to earn a living. But the attitudes of people of one race toward those of another vary. In some countries, persons of any color may hold high positions in public or professional life. Mexico is noted for its program to grant Indians the same rights as whites. But in Paraguay and Peru, white men and a few mestizos control nearly all the business and political activity.

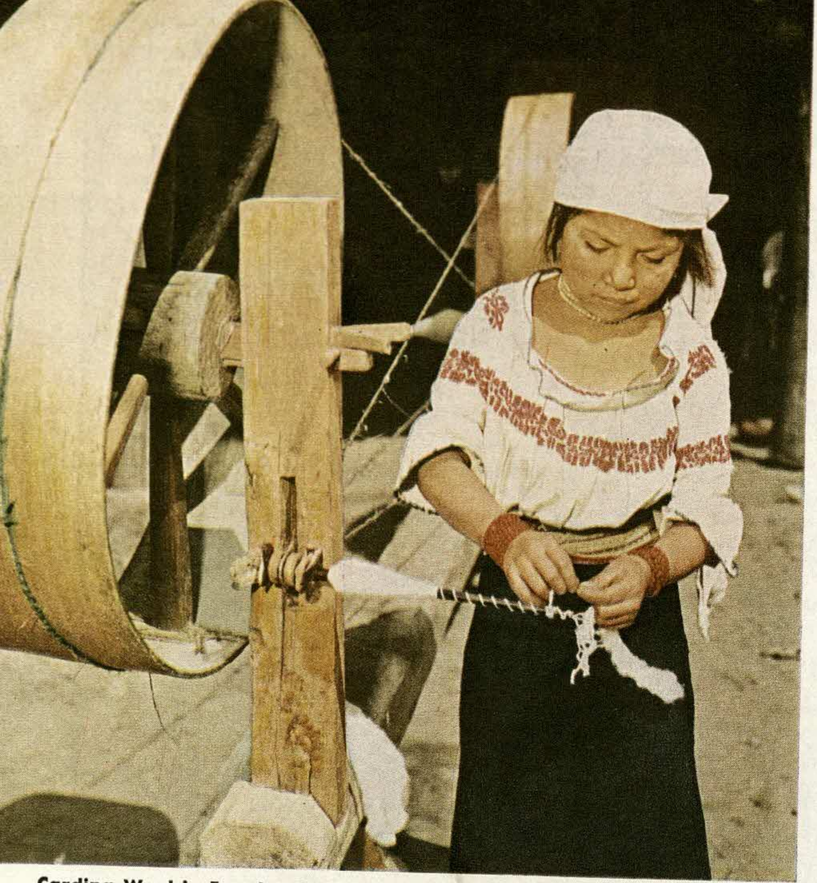
Shelter. There is no typical Latin-American house. The architecture for many houses formerly came from

LATIN-AMERICAN REPUBLICS

Country	Area in Sq. Miles	Population	Capital	Date of Independence
Argentina	1,072,467	20,057,900	Buenos Aires	1816
Bolivia	424,162	3,019,031	La Paz	1825
Brazil	3,288,042	60,080,000	Brasília	1822
Chile	286,396	5,930,809	Santiago	1818
Colombia	439,519	12,939,140	Bogotá	1819
Costa Rica	19,695	800,875	San José	1821
Cuba	44,218	5,829,029	Havana	1898
Dominican Republic	18,816	2,135,872	Ciudad Trujillo	1844
Ecuador	106,000	3,613,170	Quito	1822
El Salvador	8,260	1,855,917	San Salvador	1821
Guatemala	42,042	2,788,122	Guatemala	1821
Haiti	10,714	3,097,220	Port-au-Prince	1804
Honduras	43,266	1,505,465	Tegucigalpa	1821
Mexico	760,373	25,791,017	Mexico City	1821
Nicaragua	48,636	1,057,023	Managua	1821
Panama	28,575	910,000	Panamá	1903
Paraguay	157,047	1,408,400	Asunción	1811
Peru	482,258	9,758,000	Lima	1821
Uruguay	72,172	2,202,936	Montevideo	1828
Venezuela	352,143	5,091,543	Caracas	1830

There is a separate article in THE WORLD BOOK on each of these countries and their capitals.

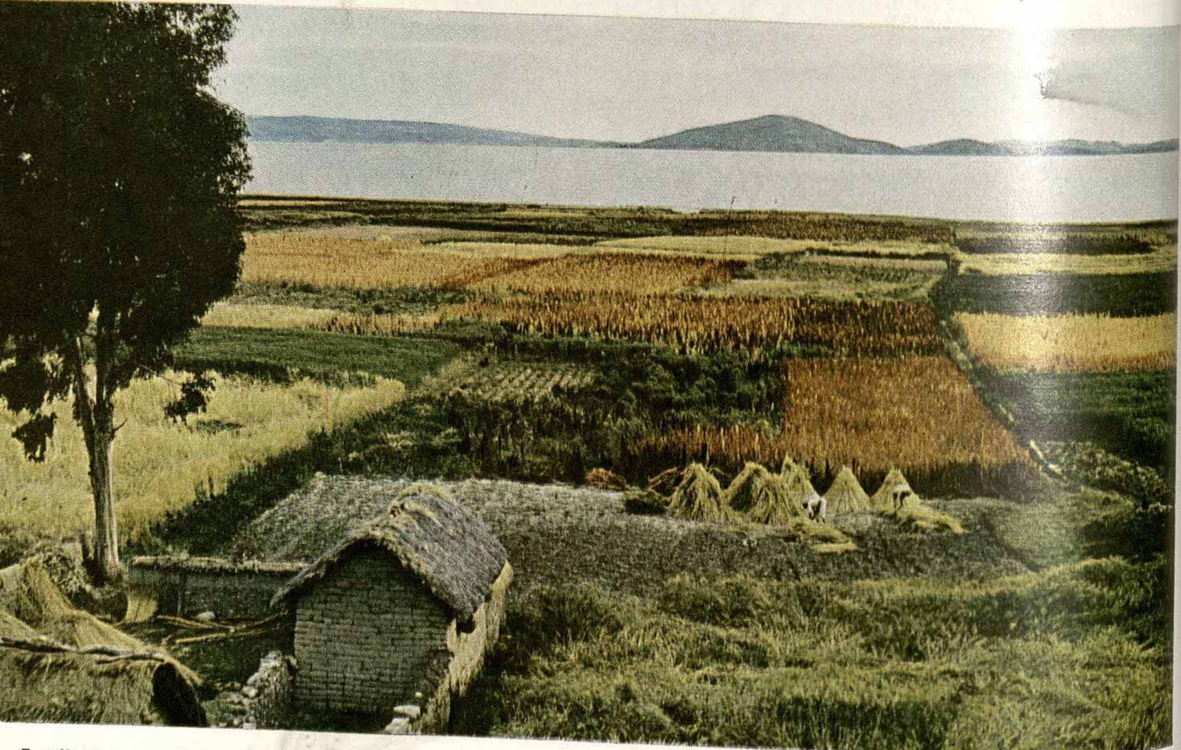

LATIN AMERICA
NORTH AMERICA
UNITED STATES
St. Louis
Cleveland
New York
Halifax
Washington
El Paso
Houston
New Orleans
Rio Grande
Chihuahua
SA. MADRE OCCIDENTAL
SA. MADRE ORIENTAL
MEXICO
PEN. DE BAJA CALIF.
Gulf of Mexico
Guadalajara
CITLALTEPETL 18,696 FT.
Mexico City
Vera Cruz
Miami
PEN. DE YUCATÁN
Havana
BAHAMA IS. (BR.)
GREATER ANTILLES
CUBA
BRITISH HONDURAS
Belize
JAMAICA (W. I. F.-BR.)
GUATEMALA
Guatemala
HONDURAS
EL SALVADOR
San Salvador
Tegucigalpa
Kingston
HAITI
Port-au-Prince
DOMINICAN REPUBLIC
Ciudad Trujillo
San Juan
PUERTO RICO (U.S.A.)
Managua
NICARAGUA
CENTRAL AMERICA
COSTA RICA
San José
Caribbean Sea
PANAMA
Panamá
Barranquilla
LESSER ANTILLES
North Atlantic Ocean
Equator
Gulf of Panama
Maracaibo
Medellín
Caracas
Port-of-Spain
TRINIDAD (W. I. F.-BR.)
Orinoco
VENEZUELA
GALÁPAGOS ISLANDS (ECUADOR)
C. SAN FRANCISCO
Cali
Bogotá
COLOMBIA
BRITISH GUIANA
Georgetown
GUIANA HIGHLANDS
Paramaribo
SURINAM (NETH.)
Cayenne
FRENCH GUIANA
Quito
CHIMBORAZO 20,577 FT.
Guayaquil
ECUADOR
PTA. NEGRA
Negro
Manaus
C. RASO
Pará
ANDES MOUNTAINS
PERU
Amazonas
(Amazon)
Belém
HUASCARÁN 22,205 FT.
Madeira
Lima
South Pacific Ocean
Tocantins
L. Titicaca
ILLAMPU 21,490 FT.
SERRA DOS PARECIS
Fortaleza
FERNANDO DE NORONHA (BRAZIL)
Arequipa
La Paz
BRAZIL
Natal
São Francisco
BOLIVIA
BRAZILIAN HIGHLANDS
Recife
SOUTH AMERICA
Sucre
Maceió
Brasília
Salvador
SAN FELIX
SAN AMBROSIO (CHILE)
CHILE
PARAGUAY
Belo Horizonte
OJOS DEL SALADO 22,590 FT.
Paraná
PICO DA BANDEIRA 9,462 FT.
PTA. BALEIA
Asunción
São Paulo
JUAN FERNÁNDEZ (CHILE)
ACONCAGUA 22,834 FT.
Valparaíso
Mendoza
Curitiba
C. DE SÃO TOMÉ
C. FRIO
Santiago
Santa Fe
Rio de Janeiro
ARGENTINA
Paraguai
Pôrto Alegre
C. SANTA MARTA GRANDE
Concepción
Rosario
URUGUAY
ANDES MTS.
Buenos Aires
L. dos Patos
Montevideo
Colorado
Bahía Blanca
La Plata
CHILOE
C. SAN ANTONIO
PTA. RASA
PEN. VALDÉS
South Atlantic Ocean
SAN VALENTÍN 13,314 FT.
C. RASO
Golfo de San Jorge
C. TRES PUNTAS
CHONOS ARCHIPELAGO
Punta Arenas
TIERRA DEL FUEGO
Port Stanley
FALKLAND IS. (BR.)
SARMIENTO 7,546 FT.
CAPE HORN
MILES 0 500 1,000 1,500
LATIN AMERICA



Carding Wool in Ecuador Often Is a Family Project. This girl is straightening the fibers and pulling them together. Her mother will spin and dye the yarn. Her father will weave it into beautiful blankets and shawls of many colors.

Threshing in Venezuela sometimes is done by animals. These horses are trampling straw to beat out the grain.

The Market at Riobamba, Ecuador. This woman who carries her baby in her shawl has trudged many miles to market.



Fertile Farmlands More Than Two Miles Above Sea Level line the shores of lovely Lake Titicaca. This lake between Bolivia and Peru is one of the largest in South America. It lies about 12,000 feet above sea level, and is surrounded by peaks of the Andes Mountains. Some of the high peaks of this range, the longest mountain range in the world, can be seen in the background.

Dumke, Publix; Herbert C. Lanks; Bell, Sawders

Spain and Portugal. These houses were built around flower-filled patios, or courtyards, and still stand in some of the older cities and towns. Most older houses are made of adobe (sun-dried clay brick) and have only one or two rooms. In the 1900's, the governments built large housing developments in the larger cities (see HOUSING [Housing Since 1900]). Most of the newer houses are built of lumber, brick, or concrete. They generally have red tile roofs and two or three rooms. Tall hotels and apartment buildings give a strikingly modern appearance to the sky lines of all the large cities of Latin America.

Latin-American plantation owners usually live in large tile-roofed stucco homes, painted white, pink, blue, or yellow. Farm families usually have homes built of wood or adobe, and roofed with thatch. The Indian villages usually consist of one-story, thatch-roofed houses of mud or adobe. In the lowlands of Central America and the Amazon Valley, wooden houses stand on stilts to prevent damage by floods and to protect the inhabitants from reptiles and wild animals. In Central America, some of these houses have only three walls. The fourth side is left open to allow air to circulate through the building.

Clothing. Indian costumes vary from light pajama-like suits in the hot areas to heavy, many-colored *ponchos* (blankets with a slit in the middle for the head) in colder regions. The Indian of the highlands wraps himself in a gay *serape*, a kind of blanket worn around the shoulders, and wears a wide straw or felt hat called a *sombrero*. He either goes barefooted or wears leather sandals called *huaraches*. In the highlands of Guatemala, Ecuador, Peru, and Bolivia, women wear heavy woolen skirts covered with brightly colored hand-woven designs. The upper and middle classes wear clothing similar to that worn in the United States and Canada. On national and religious holidays, the people of many Latin-American countries dress in elaborate Spanish-colonial costumes. See CLOTHING (color picture, Latin America).

Food. The Indians eat simple meals, usually consisting of foods that they raise. In Mexico and Central America, they live on corn, beans, and a little meat. In Bolivia, Ecuador, and Peru, they use these same foods, but potatoes form an important addition to their diets. Indians in tropical and semitropical regions eat highly seasoned foods containing many kinds of peppers. Most Indian families and most low-income workers of all races have poorly balanced diets that lack fresh fruits and vegetables.

Wealthier Latin Americans eat many of the same types of foods eaten by families in the United States and Canada, except that in some areas their dishes contain stronger seasoning. For example, Colombians usually season chicken with salt, black pepper, onions, green pepper, chili pepper, bay leaf, orégano, and red wine. Wealthy Latin Americans use large amounts of meat, especially in Argentina and Uruguay. People near the coast eat many kinds of fish and sea food.

The people drink much coffee, particularly in Brazil, Venezuela, and other countries where it grows. South Americans also enjoy yerba maté. This is a drink made from the leaves of the Paraguay tea tree, a holly tree that grows in Argentina, Brazil, and Paraguay. Latin Americans drink much chocolate, mixed with milk or water. Indians of the West Indies introduced chocolate to white men when they gave it to members of Columbus' crew.

Recreation. Latin Americans enjoy many leisuretime activities. Many of these activities came from Spain, Portugal, Great Britain, and the United States. Bullfights draw large crowds in Colombia, Mexico, Peru, and Venezuela, but most countries have banned this sport. Cockfighting attracts large audiences in Mexico, Venezuela, and the West Indies. Latin Americans, particularly Mexicans and Cubans, enjoy *jai alai*, a swift ball game (see JAI ALAI). Lotteries are legal, and in many cases the governments run them (see LOTTERY). The profits are often used to pay for public-welfare activities. Hunters track such game as jaguar and wild boar in southern South America, and armadillos and crocodiles in the Amazon Valley. Fishermen catch many kinds of fish, including swordfish, snapper, and tuna in the coastal waters.

Large crowds attend such games as basketball, baseball, and a type of football called soccer (see SOCCER). Golf courses and tennis courts are common near the large cities. Many persons, particularly in Argentina, Brazil, and Uruguay, enjoy horse racing and polo (see POLO).

Motion pictures provide one of the chief amusements. Large cities have operas, concerts, and theater plays. The people also take an active part in the frequent religious processions and festivals.

Latin Americans, particularly Indians, travel to sacred places on holy days to celebrate religious *fiestas*, or festivals. For example, every year between December 3 and 13, Indians gather outside Mexico City at the shrine of the Virgin of Guadalupe, the patron saint of Mexico. To honor the Virgin, they perform dances similar to those of their ancestors hundreds of years ago. In other Latin-American countries, thousands of Indians come into the cities on festival days.

Poverty causes most of Latin America's problems. The overwhelming majority of people cannot afford adequate food, shelter, clothing, or medical attention. The people of Bolivia, Ecuador, Paraguay, Peru, and most of Central America suffer the greatest hardships. Entire families often work long hours for a few cents a day, and have little chance of improving their conditions. For example, the *inquilinos*, or farm laborers, of Chile have a daily wage that equals only about 20 cents in the United States.

Because of the unequal distribution of land, the majority of Latin Americans work as farm laborers at low wages, or as share croppers. Owners of huge Latin-American farms have great wealth, social prestige, and political influence. The unequal division of property, and the power of the landowners, dates back to the early days of the European conquest in the 1500's. It developed from the feudal system that was widespread in Spain and Portugal at that time (see FEUDALISM). Since the Mexican Revolution of 1910, several countries, including Bolivia, Mexico, and Uruguay, have broken up large estates and sold the land to farmers.

Education

All the Latin-American republics have free public schools. But, in general, they lack adequate schools and well-trained teachers. Argentina and Uruguay have made the most progress in education. They provide schooling for about 90 of every 100 children. Argentina spends as much as one fourth of its revenue on schools. Chile, Colombia, Guatemala, and Mexico set aside about 15 per cent of their budgets for education. Costa Rica has an excellent school system, and Mexico has progressed rapidly since 1910. In many countries, including Argentina, Brazil, Uruguay, and Mexico, adult schools serve persons who have not completed their education. Bolivia, Ecuador, and Peru have schools for only about 10 or 20 of every 100 children. More than 80 of every 100 persons can read and write in Argentina, Costa Rica, and Uruguay. But in Bolivia, Ecuador, Paraguay, and Peru, between 60 and 80 of every 100 persons are illiterate.

The education of farm children creates a problem for most Latin-American countries. Children in farm families often live far from any school, and, even where schools are available, many children must work to help support their families. To create more schools, Bolivia, Cuba, Venezuela, and other nations have organized rural missions like those that Mexico first established in 1923. Teachers go to outlying communities to help train local teachers and set up schools. Many of these schools hold classes after children and adults have finished working in the fields. In some countries, including Colombia, Panama, and Peru, teachers travel to areas that have no schools. They hold classes in homes or public buildings. After three or four months, the teachers move to another community.

Latin-American universities differ in many ways from those in the United States. School sports attract little attention, and universities seldom check students' attendance at classes. Most universities have no campuses. Generally, the various departments occupy different buildings in the city where the school is located. But some Latin-American universities, including the University of Brazil, the National University of Colombia, and the National University of Mexico, have beautiful campuses in suburban communities. The governments finance and partly control many universities and pay the students' tuition.

About half the universities and schools in Latin America are privately owned, mostly by the Roman Catholic or Protestant churches. Institutions called *foreign schools* serve students of various nationalities living in Latin America, as well as Latin Americans.

Religion

Most of the men who conquered Latin America came from the Roman Catholic countries of Spain and Portugal. Missionaries, mainly Jesuits, Dominicans, and Franciscans, pushed into the frontiers of the new Spanish and Portuguese lands, building schools and churches as they went. They often protected the Indians against the soldiers' greed and cruelty. Today, more than 90 of every 100 Latin Americans are Roman Catholics. The Roman Catholic Church is the official state church in Argentina, Bolivia, Colombia, Costa Rica, the Dominican Republic, Paraguay, and Peru. But all Latin-American countries have freedom of worship.

For about 300 years, the Roman Catholic Church dominated education and had a large share of political control throughout Latin America. But, during the 1800's, especially after 1850, many of the governments suppressed religious orders and took away the church's control of education. They also seized many of the church's extensive land holdings, and took over the regulation of marriages, birth records, and cemeteries.

The Arts

Literature. Latin Americans have long valued the printed word as a means of communication. The first printing press in the Western Hemisphere was set up in Mexico City in 1539. That year, it was used to print the first book published in the Americas. The literature of most of the republics falls into three main periods: (1) the colonial period, (2) the struggle for independence in the early 1800's, and (3) the modern period.

The Colonial Period. Religious topics and stories of the conquest of the Indians provided most of the material for the early writers. Alonso de Ercilla y Zúñiga (1533-1594) based his epic poem *La Araucana* on the struggle between the Spaniards and the Araucanian Indians, who lived in what is now Chile. This book, published in 1569, is usually considered the first noteworthy literary work produced in the Americas.

The Spanish soldier Bernal Diaz del Castillo (1498-1568), in his *True History of the Conquest of New Spain*, dealt with the conquest of Mexico. Alvar Núñez Cabeza de Vaca (1490?-1557?), a Spanish governor of Paraguay, wrote *The Relation and Commentaries*. This book told of the conquest of the Indians in Paraguay. He also wrote in *Shipwrecks, Travels, and Miracles* of his wanderings from 1528 to 1536 in what is now the southern United States and northern Mexico. The Mexican nun, Sister Juana Inés de la Cruz (1651-1695), was known as "The Tenth Muse of Latin America" because of her excellent poetry. The Peruvian historian, Garcilaso de la Vega (1539?-1616), charmingly recorded many ancient Inca legends.

The Struggle for Independence. As Latin Americans became dissatisfied with European rule, they read foreign writings that were smuggled into the colonies. Works written by French Revolutionists stimulated Latin-American dreams of liberty. News that North American colonists had won a victory against England also stirred literary men to write for the cause of freedom. Many historians believe that the writers who used their talents for independence did as much to win freedom as those who fought in battle. Most Latin-American authors turned to French literature, and imitated the style of the French writers of that time. But their themes remained chiefly Latin American.

Several writers made major contributions during this period and during the period of nation-building that followed. The Ecuadorian poet and statesman José Joaquín Olmedo (1782-1847) wrote the patriotic "Ode to Junín," expressing admiration for Simón Bolívar. The Venezuelan author and statesman Andrés Bello (1781-1865) wrote "Ode to Agriculture in the Torrid Zone" in 1826.

Famous Argentine authors of this period include Juan Bautista Alberdi (1814?-1884), Bartolomé Mitre (1821-1906), and Domingo Faustino Sarmienio (1811-1888). Sarmiento, who later became president of Argentina, wrote *Civilization and Barbarism*, about an Argentine dic-

Grace Line

Fogg Art Museum, Harvard University

The Inca of Peru produced fine works of art, like the pottery *above*, long before white men ever came to the region.

The Maya, who lived throughout Central America, also made excellent works of art, such as the stone head of a maize god, shown at the *right*.

Mayan Sculptors carved tall monuments known as *date stones, left,* which tell about events that occurred in the lives of their ancestors.

James Sawders

tator of the day. It was the first Spanish-American work translated into English.

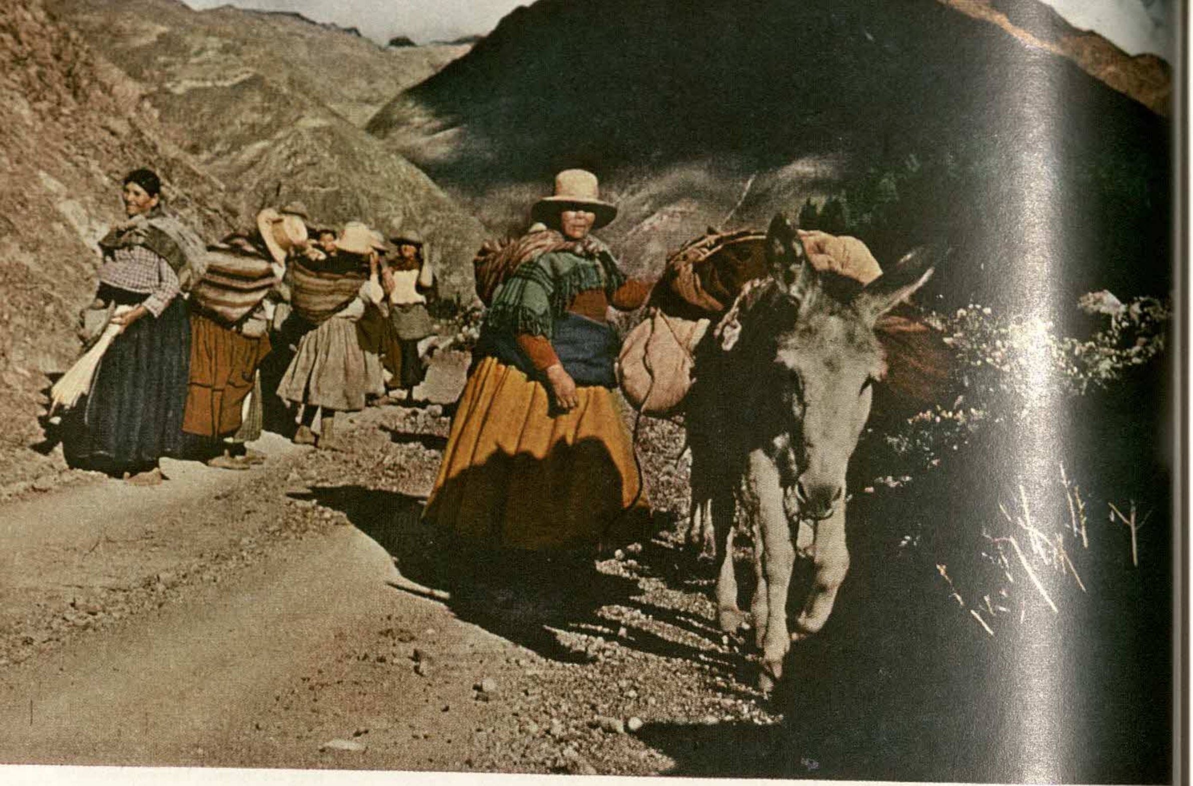
Jorge Isaacs (1837-1895), a Colombian, achieved fame for his novel *Mariá*, published in 1867. This was one of the first major novels written in South America. The conditions of the Indians captured the attention of many writers during this period. Clorinda Matto de Turner (1854-1909), a famous Peruvian author, wrote *Birds Without Nests*, about the difficult life of the Indians. The Uruguayan author Juan Zorrilla de San Martín (1857-1931) and the Ecuadorian writer Juan León Mera (1832-1894) dealt with similar topics.

Other important writers during the period following independence included Ricardo Palma (1833-1919), Peruvian author of *Peruvian Tradition;* Benjamín Vicuña Mackenna (1831-1886), Chilean historical writer; Juan Montalvo (1833-1889), Ecuadorian essayist; and Justo Sierra, Sr. (1814-1861), Mexican writer.

The Modern Period. In the late 1880's, a new literary movement called *modernista* grew up, led by Rubén Darío (1867-1916), the famed Nicaraguan poet. Writers throughout Latin America revolted against European thinking. They turned to their own world, and began to develop their own styles of writing.

The most important poets who followed Darío's example included the Bolivian Ricardo Jaimes Freyre (1870-1933), the Mexican Amado Nervo (1870-1919), and the Peruvian José Santos Chocano (1875-1934). The Uruguayan essayist José Enrique Rodó (1872-1917) wrote the famous *Ariel*, stressing the importance of the spiritual and cultural aspects of life. His work ranks among the most distinguished Latin-American literature.

Latin-American writers today deal mostly with local and national themes that describe the lives and the

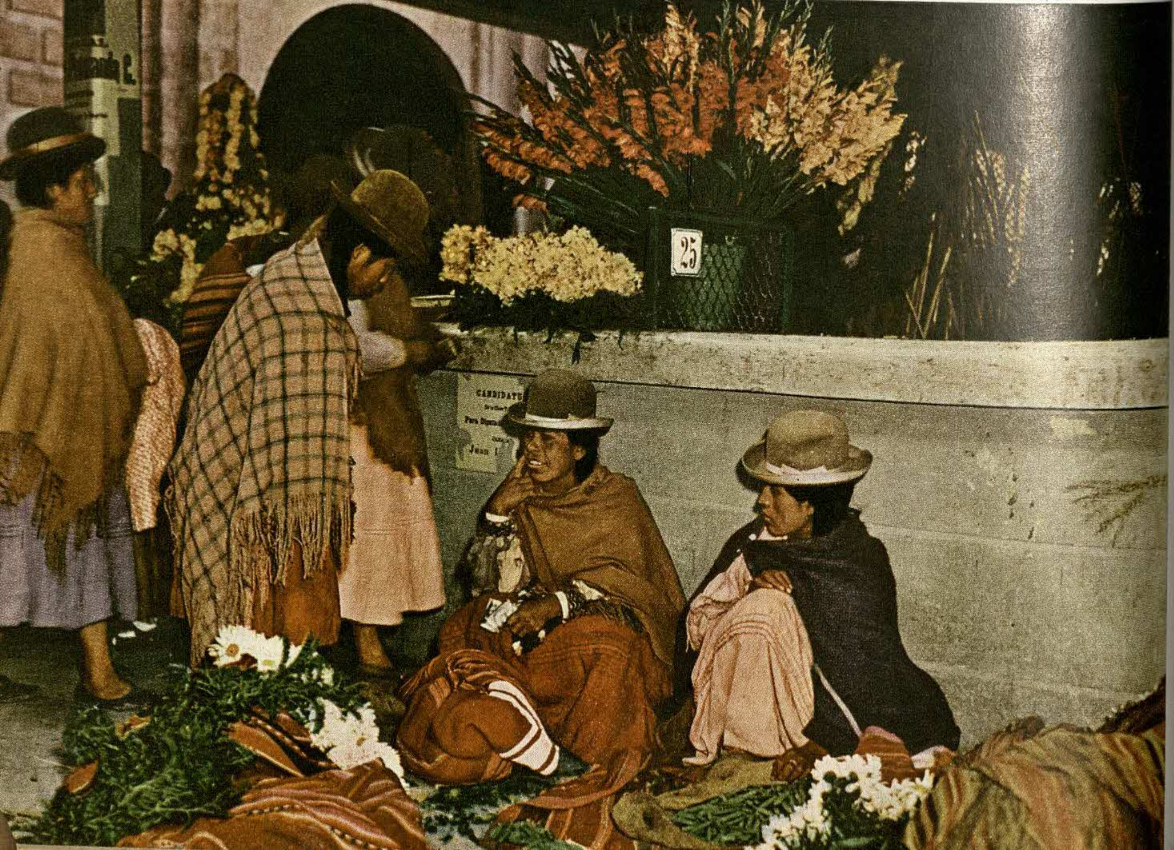


Ivan Dmitri

Peruvian Indians Often Walk 100 Miles To Go Marketing. They make their weekly trip to market carrying heavy produce on their own backs or on the backs of burros. Costumes of the women include numerous petticoats and gaily-colored shawls.

Bolivia Has Many Colorful Flower Markets, such as this one in La Paz. The flower sellers arrange daisies, gladioli, and other flowers in attractive displays to attract buyers. Many of the Indian women wear hats shaped much like a derby.

Dumke, Publix



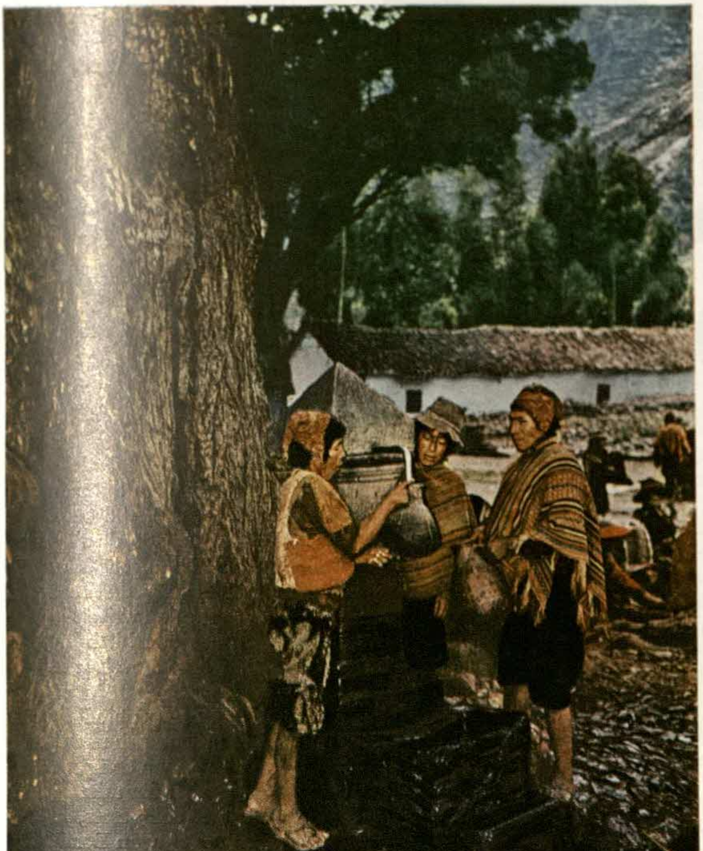
Herbert C. Lanks

A Wayside Shrine in Colombia, *upper left,* offers a convenient place of worship along a highway.

A Guatemalan Indian, *upper right,* weaves a shawl in the traditional design of her village.

Villagers of Peru, *left,* often pump water into their pitchers from wayside water pumps.

M. F. Coplan



Dumke, Publix

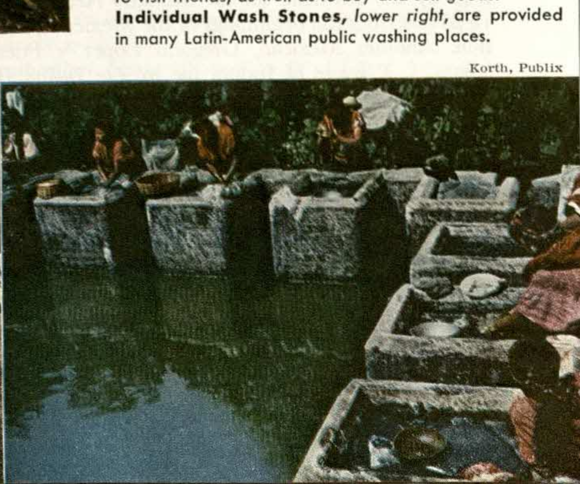
A Fisherman on Beautiful Lake Titicaca, *above,* works with nets in his lightweight balsa boat.

Markets in Latin America, *lower left,* are places to visit friends, as well as to buy and sell goods.

Individual Wash Stones, *lower right,* are provided in many Latin-American public washing places.

Herbert C. Lanks

Korth, Publix



Branson DeCou

Latin-American Craftsmen, *left,* produce lovely handmade objects from precious metals.

Many Designs used by present-day craftsmen come from motifs from Inca or Maya objects, like the Peruvian jar, *below right,* or the Inca mask, *below left.*

American Museum of Natural History

American Museum of Natural History

needs of the people. Modern writers concern themselves with such subjects as unemployment, discontent among laborers, and abuse of the Indians. The novel *The Under Dogs* by the Mexican author Mariano Azuela (1873-1952) describes the beginnings of the Mexican Revolution. Another Mexican, Gregorio López y Fuentes (1895-), wrote of Indian life in *The Indian.* The Argentine, Ricardo Güirades (1886-1927), painted a vivid picture of life on the pampas (plains) in his *Don Segundo Sombra. The Vortex,* by Jose Eustacio Rivera (1889-1928), deals with the Colombian jungle, and *Doña Bárbara,* by Rómulo Gallegos (1884-), tells with great insight a story of life on the great open plains of Venezuela.

Brazilian Literature. Brazilians have produced some of Latin America's most important literature. It does not fall into the same periods found in other Latin-American countries, because Brazil won independence without bloodshed. The best-known Brazilian authors include Antônio Gonçalves Dias (1823-1864), the country's greatest poet; Joaquim Maria Machado de Assis (1839-1908), a novelist and poet; and the novelists Euclydes da Cunha (1866-1909) and José Pereira da Graça Aranha (1868-1931). Contemporary Brazilian writers include Gilberto Freyre (1900-), a social historian, and Érico Veríssimo (1905-), whose novels deal with life in the district of Rio Grande do Sul.

Music. Most Latin-American composers copied the style of European music until the late 1800's, when they developed a style of their own. The Brazilian composer Antônio Carlos Gomes (1836-1896) used Indian themes in his opera *The Guaraní.* So did later composers, including the Chilean Carlos Lavín, the Peruvian Daniel Alomías Robles, and the Mexican Jesús Castillo.

Some of the most distinctive music comes directly from the Indians in Bolivia, Ecuador, Mexico, Peru, and other Latin-American countries. Much Latin-American music also mixes melancholy Indian tunes with joyous Spanish strains. The result is called *mestizo music.* Portuguese, Indians, and Negroes have influenced the music of Brazil. In Caribbean countries, Negro and Spanish music blend to produce the *rumba* and other characteristic styles.

Audiences enjoy the music of composers including the Brazilian Heitor Villa-Lobos, and the Mexican Carlos Cháves. Other important composers are Alberto Williams of Argentina, Enrique Soro and Humberto Allende of Chile, Manuel Ponce of Mexico, Daniel Alomías Robles of Peru, and Eduardo Fabini of Uruguay.

The pianists Guiomar Novaes of Brazil and Claudio Arrau of Chile, and the Brazilian opera singer Bidu Sayão, have also achieved international fame.

Dancing. Many Latin-American folk songs lend themselves to both singing and dancing. Latin America has many lively and colorful dances besides the well-known tango, rumba, and samba. One of these is the *pericón* of Argentina and Uruguay, in which several couples dance in a circle. So is the Negro-influenced *maxixe* of Brazil, a dance somewhat like a tango. During carnivals, Latin Americans often build temporary dance floors in parks and plazas, and rope off the streets for dancing. This form of self-expression is an integral part of Latin-American life. Indians and Negroes in country districts have their own dances that often have religious meanings. The dances form a major part of colorful holiday celebrations.

Painting. The Spanish encouraged art soon after the conquest of Latin America. They opened an art school in Mexico City in 1530, and another in Quito, Ecuador, soon afterward. Artists during the colonial period mostly painted pictures with religious themes. After the Latin-American nations won their independence, many artists went to Europe to study. An era of imitating European style lasted until the 1900's. Latin-American artists then returned to American subjects and developed their own styles.

The Argentine painter Cesareo Bernaldo de Quirós has gained fame for his *gaucho*, or cowboy, scenes. The revolutionary murals of Diego Rivera and José Clemente Orozco stress Mexican history and mankind's struggle for freedom. Many people in the United States know Rivera best for his frescoes in the Detroit Institute of Arts, and Orozco for his murals in the Dartmouth College Library. Camilo Blas, Julia Codesido, and José Sabogal paint Peruvian scenes and Indians.

An important group of painters in Haiti base their work on the folklore and the daily life of the Negroes. A Brazilian artist, Cândido Portinari, who paints scenes depicting the common people of Brazil, has done murals in the Library of Congress in Washington, D.C., and in the United Nations General Assembly building in New York City.

Sculpture. Some Indians of Latin America were excellent sculptors long before white men came to the Western Hemisphere. Carved stone panels and huge columns shaped like serpents or human figures decorate ancient Indian buildings in parts of Latin America. The principal achievements of the colonial period were the stone sculpture and gilded wood carvings used to decorate the churches. The Brazilian sculptor and architect, Antônio Francisco Lisboa (1730?-1814), created some of the finest sculpture during this period. Today, the work of the Bolivian sculptress Marina Núñez del Prado (1910-   ) ranks among the best in Latin America.

Architecture. Buildings designed by Indian architects hundreds of years before the European conquest still stand in Latin America. The Aztec, Toltec, and Maya built great stone temples on the tops of enormous pyramids in Mexico and Central America. The Incas were excellent stonemasons. Their sturdy buildings in South America still withstand violent earthquakes that often severely damage modern buildings. Churches and cathedrals, generally built in the elaborate Spanish style of the 1500's and 1600's, represent the most important architecture of colonial Latin America. The Brazilian Oscar Neimeyer, Jr., has designed many notable buildings in Brazil in the 1900's. He also worked with the architects who designed the United Nations buildings in New York City.

Handicrafts. The Indians of Latin America have been expert potters, weavers, and metalworkers, since long before Columbus sailed to America. They still make colorful pottery and textiles, and produce excellent handmade copper, silver, and tinware. Tourists from the United States, Canada, and other countries help support the market for these items, providing a source of income for the Indians.

History

Early Days. The first Americans probably came from Asia 10,000 to 20,000 years before Columbus sailed to the Western Hemisphere. They may have crossed from Asia on ice, or on a tip of Alaska now under water. Or they may have traveled in boats across the Bering Strait, or from island to island in the Aleutians. The Asiatic tribes gradually spread throughout North and South America.

These people from Asia, whom we now call American Indians, wandered about the land hunting and fishing. After many generations in America, some of the tribes developed new ways of living. Instead of wandering, they built communities of farms. These people were the first to grow cocoa, corn, kidney and lima beans, potatoes, squash, and tobacco. In areas where farmers could raise good crops and lead a pleasant life, the population grew rapidly.

The Mayan culture became the first highly developed civilization in the Western Hemisphere. It began in Central America hundreds of years before the birth of Christ. By 600 B.C., the Maya had developed a calendar and a system of writing. They also developed distinctive styles of architecture, sculpture, and metalwork. They had a highly organized government, and a great knowledge of astronomy and agriculture.

By the time of the Spanish invasion in the 1500's, four major Indian civilizations flourished in Latin America: the Maya in Central America, which combined with the Toltec of Mexico about A.D. 600; the Chibcha in Colombia; the Aztec in Mexico; and the Inca in Ecuador, Peru, and Bolivia. See AZTEC; CHIBCHA INDIANS; INCA; MAYA; TOLTEC INDIANS.

These civilizations greatly influenced the later development of Latin America. The gold and silver produced by their mines led the Spanish to conquer the Indians as quickly as possible.

Exploration. Spain claimed much of Latin America immediately after Columbus discovered the region in 1492. Portuguese explorers also claimed lands in the Western Hemisphere. The two countries often claimed the same lands. To settle the conflicts, Pope Alexander VI drew up the Line of Demarcation in 1493. This imaginary north-south line lay about 250 miles west of the Azores and Cape Verde Islands. The Spanish and Portuguese had explored only a small part of the Western Hemisphere at this time. They agreed to allow Spain all the lands it might discover west of the line, and Portugal all the lands east of it. The agreement

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Millions of Indians in Latin America have little contact with modern life. Most of them live in isolated mountain villages, or in the thick jungles that cover much of the land. Those above live in a village along Guatemala's Lake Atitlán.

applied only to lands not held by a Christian ruler. See LINE OF DEMARCATION.

But the Portuguese became dissatisfied with the line, because they thought it gave Spain too much territory. In 1494, Portugal and Spain signed the Treaty of Tordesillas, which moved the line about 930 miles west. Portugal received the eastern bulge of the continent that now makes up most of Brazil. Spain's territory lay to the west, stretching from Mexico to the southern tip of South America.

Between 1492 and 1502, Columbus made four voyages to America and established several small settlements in the West Indies. Pedro Álvares Cabral, a Portuguese navigator bound for India, accidentally discovered the coast of Brazil during the spring of 1500. Cabral thought he had discovered an island, and claimed it for his country. The Italian navigator Amerigo Vespucci, for whom America is named, sailed to America under the Spanish flag in 1497 and 1499, and under the Portuguese flag in 1501 and 1503. He explored the coasts of Brazil, Uruguay, and Argentina. The Portuguese navigator Ferdinand Magellan explored most of the coast of Argentina in 1520.

In the early 1500's, *conquistadores*, or conquerors, including Hernando Cortes and Francisco Pizarro, helped give Spain a firm hold on Latin America. Cortes landed on the shores of Mexico in 1519. Two years later, with only 600 men, a few light cannon, and a small number of horses, he became master of the ancient Aztec capital of Tenochtitlán (now Mexico City). Cortes controlled most of Mexico by the end of the year. One of his officers, Pedro de Alvarado, pushed south from

Tom Hollyman, Photo Researchers, Inc.

The Older Parts of Most Latin-American Cities resemble the cities of Spain or Portugal, where the early settlers came from. The stone pavement and twin church towers on this street in Salvador, Brazil, make it look much like a southern European street.

Mexico into Central America in 1523. That year he met forces driving north from the Spanish base founded in Panama by Vasco Núñez de Balboa, and secured all Central America for Spain.

In 1531, Pizarro sailed south from Panama with 180 men and 27 horses. He landed in Peru and, by 1533, after easy victories over the Indians, he had conquered the entire Inca empire. Pedro de Valdivia, one of Pizarro's officers, conquered Chile and founded Santiago in 1541. His conquest gave the Spaniards control of the west coast of South America from Panama to central Chile. Only in the far south did the Indians continue to resist for several more years. The Spaniards and Portuguese had conquered the Indian tribes in less than 50 years.

Colonization. From about 1500 to 1800, Spaniards and Portuguese poured into the new lands. Planters established coffee, cotton, fruit, and sugar plantations in much of the conquered territory, especially in Brazil, the Caribbean islands, and Central America. Restless seekers of gold and silver roamed the land from Mexico to present-day Bolivia.

Wherever the Europeans went, they employed the Indians to work in the fields, forests, and mines. Only the east coast of South America offered little attraction for colonists. Few Indians lived there, and the region offered no evidence of gold or silver. As a result, few people settled in the area until the 1600's, when the Europeans recognized it as excellent land for raising cattle and crops, particularly sugar.

Nevertheless, most of Latin America was colonized before the first permanent English settlers landed at

Jamestown, Va., in 1607. Unlike the English colonists, most of the Spanish and Portuguese came to America to gain quick wealth and return home. They were from the upper classes and wanted to follow the practices and traditions of their homelands while living in America. But their expeditions also included craftsmen and farmers from the lower classes. These people, like most of the English, wished to start a new life in America.

The Struggle for Independence. From 1791 to 1824, the Latin-American colonies waged the wars of revolution that freed all except Cuba, after 300 years of European rule. Most of the colonies had four basic reasons to fight for independence.

First, a large number of mestizos had gained wealth, and felt they should have an active part in their government. They had little social standing among the Spaniards, who generally discriminated against them. So they willingly led the rebellions that struck down the European overlords.

Second, the *Creoles* (people of pure Spanish ancestry born in the Americas) resented the fact that officials from Spain filled all the government offices. The Creoles also wanted to have a voice in government.

Third, Spain and Portugal prohibited trade among their Latin-American colonies for almost 300 years, and forced them to deal only with the mother countries. The Spanish and Portuguese governments ended many of these restrictions by the 1800's, but a sense of economic injustice helped prod the colonists into action.

Fourth, a feeling of nationalism grew in the colonies, and members of all classes joined forces in demanding the right to govern themselves.

A revolt against France broke out in Haiti in 1791. By 1804, Haiti had won independence. Toussaint L'Ouverture, a former Negro slave, was the chief leader of the Haitian struggle for freedom.

The immediate incidents that caused the move for independence in most countries came from Europe, where Spain and Portugal were losing their importance as world powers. In 1808, Napoleon Bonaparte, Emperor of France, drove Ferdinand VII from the throne of Spain and replaced him with his brother, Joseph Bonaparte. This led to violent reactions throughout Spanish America. In 1810, Argentine revolutionists broke with Joseph and declared their allegiance to Ferdinand. The Mexican people also arose that year against the ruling Spaniards of Joseph's regime. Two parish priests, Miguel Hidalgo and José María Morelos, led the Mexican revolt. Also in 1810, the large landowners of Chile joined with the less influential classes to declare their independence. The most picturesque of Chile's heroes was Bernardo O'Higgins.

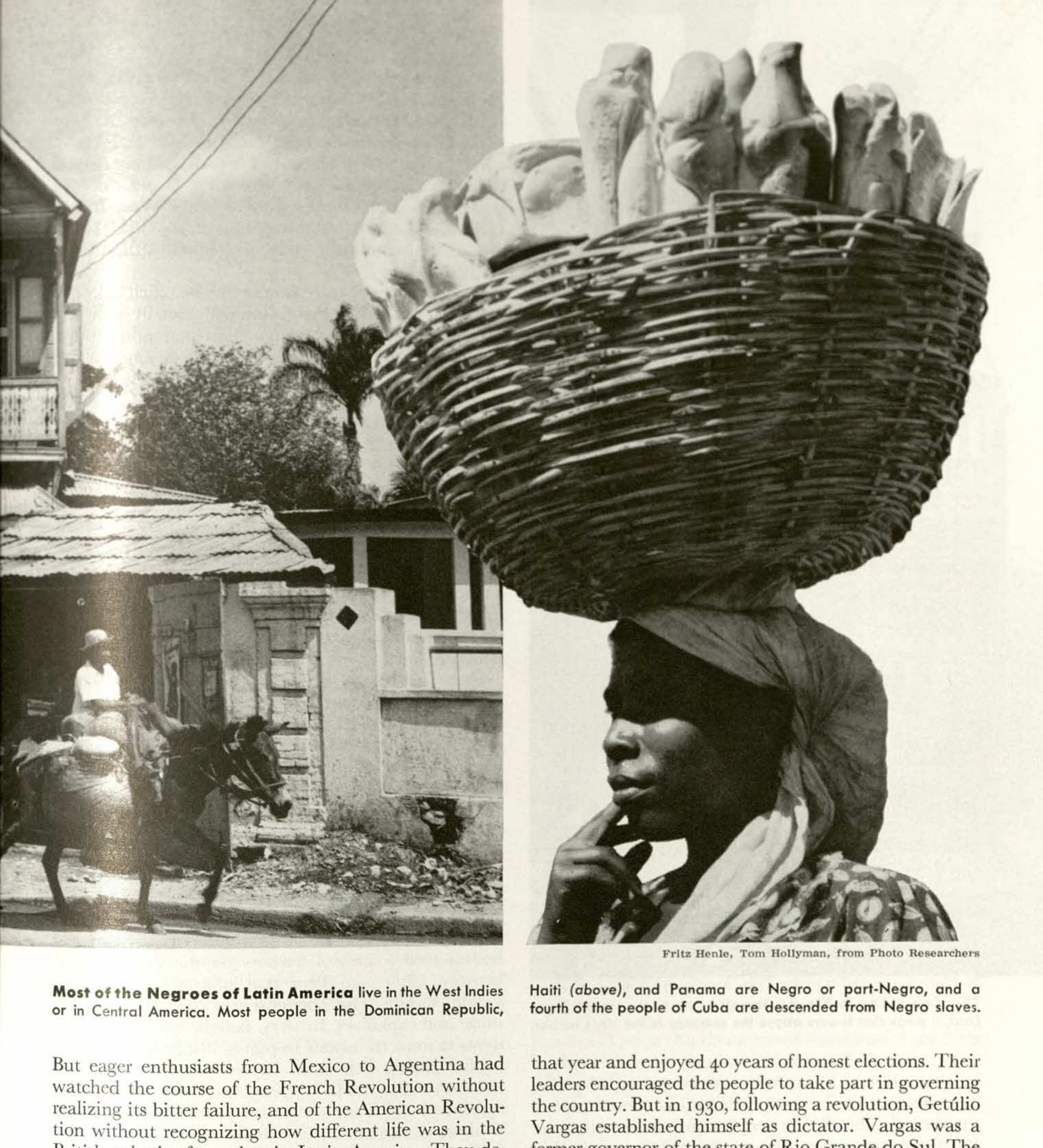
The Venezuelan revolutionist Francisco Miranda tried unsuccessfully to free his country in 1806 and again in 1810. But the great South American hero Simón Bolívar, a follower of Miranda, launched a campaign in 1813 that freed Venezuela, Colombia, Ecuador, Peru, and Bolivia. Bolívar's great victory at Ayacucho, Peru, in 1824, assured independence for all the South American colonies, although small fights occurred periodically for the next two years.

Only Brazil won its independence without war. In 1807, John VI of Portugal fled to Brazil when Napoleon invaded his country. He returned to Lisbon 14 years later, after Napoleon's defeat. John left his son Pedro to rule as regent. But the Brazilians, who, like the Spanish colonists, had come to resent European rule, demanded freedom from Portugal. On Sept. 7, 1822, Pedro declared Brazil an independent empire and took the throne as Pedro I.

The Central Americans overthrew Spanish authority in 1821. The rebels faced practically no opposition, because Spain had only weak forces in Central America, and the Spanish governor sided with the rebels.

To learn more about the struggle for independence in individual nations, see the articles on the various Latin-American countries.

Self-Government. During colonial times, Latin Americans obeyed the laws of distant kings and had almost no voice in their own affairs. When they rebelled and established their republics, they had almost no experience in democratic government. Cautious leaders such as Bolívar thought it unwise to establish republics in Latin America. They argued that the people did not have enough experience in government for self-rule.



Fritz Henle, Tom Hollyman, from Photo Researchers

Most of the Negroes of Latin America live in the West Indies or in Central America. Most people in the Dominican Republic, Haiti *(above)*, and Panama are Negro or part-Negro, and a fourth of the people of Cuba are descended from Negro slaves.

But eager enthusiasts from Mexico to Argentina had watched the course of the French Revolution without realizing its bitter failure, and of the American Revolution without recognizing how different life was in the British colonies from that in Latin America. They demanded republican government. We can better understand the course of democracy in Latin America if we study the history of a few countries.

In Brazil, the people established a constitutional monarchy under Pedro I after they overthrew Portuguese rule in 1822. But Pedro's popularity declined because of his harsh, cruel government. In 1831, he gave up his throne to his son, Pedro II. For more than 50 years under Pedro II, the Brazilians enjoyed a large measure of democratic control, and gained experience in helping to run the country. In 1888, however, Pedro freed the slaves on Brazilian plantations. This angered the influential planters, who forced Pedro to give up his throne in 1889. The Brazilians founded a republic that year and enjoyed 40 years of honest elections. Their leaders encouraged the people to take part in governing the country. But in 1930, following a revolution, Getúlio Vargas established himself as dictator. Vargas was a former governor of the state of Rio Grande do Sul. The army forced Vargas to resign in 1945, and a democratic form of government returned to Brazil when it adopted a new constitution in 1946.

In Argentina, a series of weak governments followed one another until 1829. In that year, Juan Manuel de Rosas, a wealthy landowner with his own gaucho army, seized dictatorial power. The people rebelled and overthrew him in 1852. Since then, wealthy property owners have controlled the country's politics. Dishonest elections and military revolts have often placed dictators in the presidency, in spite of strong democratic forces in the political parties and the press.

In Chile, after 20 years of political confusion, the people settled down to a long period of peace and quiet

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The Cable Car in Rio de Janeiro runs to the top of Sugar Loaf, a peak that towers above the entrance to the city's harbor.

in 1830. It was a carefully policed period of peace, however, and the landowners held firm control most of the time. In theory, the people voted in free elections. But the conservatives who represented the upper-class landowners actually controlled the voting. They passed laws requiring voters to own property and to be able to read and write. They also established high property qualifications for officeholders. As a result, the poorer people could not vote or hold office. After 1925, a series of dictatorships ruled Chile. In 1938, the liberal parties representing workers and small farmers united in the Popular Front. They won the elections that year and restored a more constitutional government. Since then, the people have chosen presidents in free elections.

In Mexico, revolts and revolutions among rival political parties marked much of the early history of the republic. People voted in controlled elections in which returns were often reported dishonestly. Presidents' terms often ended in assassination or exile. In 1934, President Lázaro Cárdenas began the reforms that established Mexico's present orderly government.

One-Man Governments have often ruled Central-American republics except Costa Rica, which has long had an orderly, constitutional government. Strict dictatorships govern two of the three republics in the West Indies, Cuba and the Dominican Republic. In the third, Haiti, politics ranks among the most violent and strife-torn in Latin America.

In lands where people cannot choose officials in free elections, changes in the government usually occur by means of force. The army often plays an important part in determining who shall control the government. This has been true since the first days of independence in Bolivia, Ecuador, Paraguay, Peru, and Venezuela. Presidential terms of office in these countries usually end in revolution. These conflicts generally involve only small numbers of persons in rival parties or army units. They do not express the wishes of the people, who often have little interest in the struggles for power.

Relations Among Latin-American Countries. Minor clashes and disputes, as well as several sizable wars, have marred the relations of neighboring Latin-American countries since they became independent. Boundary disputes caused most of the trouble, and even today certain national borders remain undefined and hotly disputed.

Brazil and Argentina. In the early 1800's, trouble between the two strongest South American nations centered on the area that is now Uruguay. War broke out between Brazil and Argentina in 1825. Three years later, a treaty established the disputed area as the independent nation of Uruguay.

Paraguay and Bolivia went to war in 1932 over the ownership of the Gran Chaco (see Gran Chaco). Peace negotiations began in 1935, and a final settlement in 1938 gave 91,800 square miles of the disputed territory to Paraguay. But both sides remained dissatisfied.

Chile, Peru, and Bolivia fought a bloody war between 1879 and 1883 because of an argument over nitrates. Bolivia held a strip of territory on the Pacific Coast between Chile and Peru that had rich deposits of sodium nitrate. This chemical was used to make fertilizer and explosives. In 1874, Bolivia had given Chile rights to mine the nitrate in part of this area and export it after paying Bolivia an export tax. Bolivia agreed not to raise this tax for 25 years. But it later entered an agreement with Peru to raise the price of nitrate mined by those two countries. In order not to be undersold by Chile, Bolivia violated its agreement of 1874 and raised its taxes. Chile refused to pay, and Bolivian troops seized its mines in 1879. Chile won the war that followed, seized the region, and forced Bolivia to give up its outlet to the Pacific. Since then, Bolivia has been a landlocked country. Chile and Peru argued over the new boundary between the two countries from the time the war ended until they finally settled its location in 1929. See Tacna-Arica Dispute.

Peru and Ecuador quarreled for years over the ownership of a wild, uncharted area between central Ecuador and western Brazil. In 1940 and 1941, the two countries fought over this region. Peru defeated Ecuador and annexed most of the territory.

Pan American Conferences. Simón Bolívar was the first to realize the importance of bringing representatives of the Americas together for conferences and planning. In 1826, he called a conference to unite all the new Latin-American republics under one government. But the nations would not agree to this plan, and the conference failed. For more than 60 years, national jealousies kept the republics from taking any action toward international cooperation.

Finally, in 1890, the United States and the Latin-American republics formed the Pan American Union. The union tries to create closer economic, cultural, and political relations among member nations. Statesmen from these countries met again in Montevideo, Uruguay, in 1933 and pledged not to interfere in each other's affairs. At the Inter-American Conference in Buenos Aires, Argentina, in 1936, all the American republics pledged to maintain peace in the Western Hemisphere.

In 1942, during World War II, all the Latin-American republics pledged their opposition to Germany, Italy, and Japan. Five years later, the Inter-American Treaty of Reciprocal Assistance, or the Treaty of Rio de Janeiro, stated that the United States and 19 Latin-American republics would settle their differences peaceably, and that an armed attack against one of them would be considered an attack against all. Only Nicaragua was not invited to the conference, because most of the other nations did not recognize the government that controlled the country, which they considered unconstitutional.

The Organization of American States (OAS) was formed at Bogotá in 1948. It aims to promote cooperation and understanding in political, economic, social, and cultural fields. It also groups the United States and all the Latin-American republics into a bloc to provide prompt, unified action in defense of the Western Hemisphere. In 1956, the heads of 18 of the Latin-American republics and President Dwight D. Eisenhower of the United States met at Panama City to discuss social and economic improvements in the Americas. The presidents of Colombia and Honduras did not take part in the conference, because of the pressure of political problems in their countries. See also ORGANIZATION OF AMERICAN STATES; PAN AMERICAN CONFERENCES; PAN AMERICAN UNION.

Relations with the United States. The United States took its first important stand in matters concerning the Western Hemisphere when it adopted the Monroe Doctrine in 1823. The doctrine was directed chiefly at France and Russia. The United States suspected these countries of trying to restore Spanish power in the Americas. The doctrine gave a clear "hands off the Americas" warning, and provided for the protection of Latin-American nations by the United States.

For many years, Latin Americans distrusted the doctrine. They considered it Yankee conceit for the United States to assume the role of nursemaid toward its sister republics to the south. But after World War II broke out, they took a more favorable view toward it. See MONROE DOCTRINE.

Latin Americans sometimes fear the power of the United States. They have called the United States "The Colossus of the North," and have suspected it of trying to control the entire hemisphere. The Spanish-American War of 1898 in which the United States won control of Puerto Rico from Spain increased these fears. Presidents William Howard Taft and Woodrow Wilson added to these suspicions when they sent U.S. Marines into Nicaragua, Haiti, and the Dominican Republic between 1912 and 1915 to protect United States interests. The distrust decreased somewhat when the first effective Pan American conference met in 1933. All the nations signed a pact pledging themselves to the "good-neighbor policy" outlined by President Franklin D. Roosevelt of the United States. When they signed the pact, the Latin-American republics agreed not to interfere in each other's affairs.

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The Natural Wealth of Latin America brings trade from all parts of the world for such raw materials as coffee, oil, and rubber.

Cultural Relations. The good-neighbor policy includes a program to increase cultural relations between the United States and Latin America. The program furthers understanding in the United States of the cultural and national life of its neighbors to the south. It also brings information about the United States to Latin America. The program includes an exchange of teachers, students, cultural leaders, scholars, professional men, and

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A Peruvian Boy Herds a Group of Llamas High in the Andes Mountains.

technicians. It also involves translation of books into Spanish, Portuguese, and English.

Technical Assistance. Under the good-neighbor policy, the United States offers technical assistance to Latin-American nations. It helps them improve their agriculture, industries, educational systems, and health services. The United States furnishes teams of experts to nations that ask for such help. These experts teach farmers how to improve their crops, and offer help and advice in training new teachers and organizing new industries. They also assist the Latin-American governments in improving the health of the people.

Relations with Other Countries. In the past, most Latin-American nations have been too busy with their own problems to take much interest in international affairs. In World War I, Brazil, Costa Rica, Cuba, Guatemala, Haiti, Honduras, Nicaragua, and Panama declared war on Germany. But only Brazil sent fighting units to the war fronts. Five other nations broke off diplomatic relations with Germany, but Argentina and six others remained neutral. After the war, most Latin-American countries joined the League of Nations. But several years later they began to withdraw from the organization because of the expenses involved, and because they believed it did not pay enough attention to the problems of small powers.

During World War II, the Latin-American countries rallied to the support of the United States after Japan attacked the Pacific island possessions of the United States in December, 1941. All the American nations declared war on the Axis Powers, although only Brazil and Mexico supplied troops.

Great Britain's relations with Latin America have been chiefly those of a profitable trader. Great Britain has had minor disputes with Argentina, Brazil, and Venezuela. But it has made no effort to extend its American holdings beyond British Honduras, British Guiana, and a few islands in the West Indies. The British invested huge sums of money in railroads, packing plants, and public utilities in Latin America during the 1800's and 1900's.

Relations with France have been chiefly cultural. Latin Americans, particularly in Argentina, often look to Paris for inspiration in the arts. But France has played little part in the political life of the republics, except briefly in the 1860's. At that time, Napoleon III sent an army to Mexico and made Maximilian emperor of Mexico. Between 1864 and 1867, the Mexicans defeated the French and executed Maximilian. See MAXIMILIAN.

The Latin-American nations have assumed a more important role in world affairs since their politics have become more settled and their economies stronger. After World War II, they became more active in international politics than they had been since winning independence. All became charter members of the United Nations. Today, the Latin-American bloc in the UN General Assembly is one of the strongest voices in the organization. ASHER N. CHRISTENSEN, TOM B. JONES, ROBERT C. SMITH

Related Articles in WORLD BOOK include:

BIOGRAPHIES

An alphabetical list of biographies relating to each Latin-American country appears under the name of the country in the BIOGRAPHY section of the READING AND STUDY GUIDE.

HISTORY

See the History section of the article on each country listed in the table with this article. See also:

Aztec
Bolívar, Simón
Chibcha Indians
Columbus, Christopher
Cortes, Hernando
Exploration and Discovery
Inca
Maya
Monroe Doctrine
O'Higgins (family)
Olmec Indians
Organization of American States
Pan American Conferences
Pan American Day
Pan American Union
San Martín, José de
Spanish-American War
Toltec Indians

UNCLASSIFIED

Bullfighting
Canasta
Central America
Christmas (Latin America)
Fiesta
Gaucho
Indian, American
Pan American Highway
Rio de la Plata
Shelter (In Latin America)
South America

Outline

I. The Land
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  E. Sculpture
  F. Architecture
  G. Handicrafts
VII. History

Questions

What are some ancient Indian handicrafts still practiced in Latin America?

Why did Simón Bolívar think it unwise to set up republics in Latin American countries? Do you think he was right?

What was at least one important way writers helped shape Latin-American history?

Why do some Latin-American homes stand on stilts and have only three walls?

What were some of the causes of the rebellions that freed most of Latin America from European rule?

Why have some Latin Americans long had a cool attitude toward the United States?

What is meant by (1) *yerba maté*, (2) *serape*, (3) *pampas*, (4) *mestizo music?*

What are some important provisions of the "good-neighbor policy"?

Who was Hernando Cortes? José de San Martín? Pedro II?

What were some of the outstanding achievements of the Maya hundreds of years before the birth of Christ?

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LATIN CROSS. See Cross.

LATIN EMPIRE, or **LATIN KINGDOM.** See Byzantine Empire (Final Decline).

LATIN KINGDOM OF JERUSALEM. See Crusades.

LATIN LANGUAGE was the leading tongue of western Europe for hundreds of years. It was the language of the Roman Empire, and Roman soldiers and traders carried it wherever they went. Greek was the language of poetry and the arts. Latin, with its precise expression, was the perfect medium for law and government. In the hands of such a master as Virgil, Latin proved capable of a dignity and tone rarely equaled in any language.

Latin has not been in general use since the Middle Ages. But it formed the basis of the Romance languages, and influenced many others. It is still the language of the Roman Catholic Church, and is used in scientific and legal terminology.

Structure

Alphabet. The Latin, or Roman, alphabet was borrowed from that of the Greeks, probably through the Etruscans. In classical times, it had 23 letters. It lacked the *j*, *u*, and *w* of the English alphabet. The alphabet as the Romans wrote it became the basis for that used by most Western languages today. See ALPHABET and the articles on each letter of the English alphabet which appear at the beginning of each letter in THE WORLD BOOK ENCYCLOPEDIA.

Grammar. Latin belongs to the Indo-European family of languages. Its grammar is closely related to those of Celtic, German, Slavic, Greek, and Sanskrit. Like Greek, Latin is highly inflected. That is, changes in meaning are indicated by changes in word-endings, rather than by prepositions or word order. For an example of the inflections of a Latin noun, see CASE (How Cases Are Used).

Development

Latin was only one of several related languages spoken in ancient Italy. Other dialects, such as Oscan, were fully as old. But they died out as the influence of Latin spread.

In Ancient Times. The earliest Latin was a crude, undeveloped tongue sometimes called *preliterary Latin*. This early form has come down to us through inscriptions and religious texts. During the 200's and 100's B.C., Latin changed from a mere common dialect to a literary language. It reached its highest point of perfection in the classical Latin of the Ciceronian and Augustan ages (101 B.C. to A.D. 14). Majestic verbal effects were achieved by Cicero and Caesar in prose and by Virgil and Horace in poetry.

Classical Latin differed from most other languages in that it had no dialects. But a *vernacular*, or common, Latin developed side by side with literary Latin. This *lingua Romana*, or Roman language, underwent many changes after the so-called Golden Age. Inflections were dropped and words became simplified. The advent of Christianity and the barbarian invasions of the Roman Empire added new vocabulary to Latin and further altered the language.

In the Middle Ages, Latin changed a great deal. The *lingua Romana* had a strong influence throughout western Europe. By the 400's it had entirely replaced literary Latin as a spoken language. After the Roman Empire fell apart, various localities in the Roman world continued to make changes in the common tongue. It was these local variants that gave rise to the Romance languages—French, Italian, Spanish, Portuguese, and Romanian.

Meanwhile, scholars continued to use a form of literary Latin in the schools and monasteries of Europe, as well as in official documents. This derived form is commonly called *Medieval Latin*.

Latin Today

In Schools. Latin has been an important school subject since the Middle Ages, and it still ranks high in popularity. Until the 1900's, a young man in his early college years not only had to read the great Latin masters fluently, but also was required to write original Latin essays and poems. In the past, no college student could earn an A.B. degree without studying Latin. Under the elective system, many colleges and universities in the United States have abandoned this requirement. But most English and European institutions of higher learning retain it.

Latin is said to have important educational values because of its precision and logical exactness. The student of Latin learns to derive the meanings of English words from the related Latin, as well as to appreciate Roman civilization as a source of many influences in modern life. He gains a background in grammar and vocabulary that will help him learn living languages. This is especially true in connection with the study of any Romance language.

Latin and English. Scholars estimate that about half of all English words in current use are of Latin origin. Most of them were borrowed from Old French, and reflect forms and meanings that Latin words had acquired in that language. But scholars also borrowed many words directly from Latin. Consequently, we have such words as *loyal* and *legal*, both from the Latin *legalis*, meaning *legal*. The form *loyal* was borrowed from the French, with its new feudal meaning.

The vast majority of English abstract words are Latin in origin. When we speak of the "power of liberty," the "spirit of independence," or the "virtue of charity," the two important words in each phrase are Latin. Many English scientific terms come from Latin. The title of every rank in the army, from *private* to *general*, has a Latin origin. Some common Latin idioms remain unchanged in English, including *persona non grata*, *ad infinitum*, and *P.S. (post scriptum)*. The richness and variety of English owe much to the contributions of Latin.

HENRY T. ROWELL

See also LATIN LITERATURE; ROMANCE LANGUAGE.

SOME UNUSUAL LATIN DERIVATIONS

antler, from *antocularis*, before the eye
bugle, from *buculus*, young bull
chapel, from *cappella*, cloak
hoosegow, from *iudicare*, to judge (through the Spanish *juzgado*)
pay, from *pacare*, to make peace
shambles, from *scamellum*, bench
sullen, from *solus*, alone
soldier, from *solidus*, gold coin
travel, from *trepalium*, instrument of torture (through the French *travailler*)
villain, from *villanus*, farm hand

LATIN LEAGUE. See ROMAN EMPIRE (The Early Republic).

LATIN LITERATURE includes the poems, plays, speeches, and other writings of the ancient Romans. In many ways, it seems to be a continuation of Greek literature, using many of the same forms. But it also mirrored the life and history of ancient Rome.

Characteristics of Latin Literature

Much Latin writing reflects the great interest the Romans had in *rhetoric*, the art of speaking and persuading. Public speaking had great importance for educated Romans, because most of them hoped for successful political careers. When Rome was a republic, effective speaking often determined who would be elected or what bills would be passed. When Rome became an empire, the ability to impress and persuade men by the spoken word lost much of its importance. But training in rhetoric continued to flourish, and to affect styles of writing. A large part of rhetoric consists of the ability to present a familiar idea in a striking new dress that attracts attention. Latin authors became masters of this art of variety.

Language and Form. Latin is a highly *inflected* language, with many grammatical forms for various words. As a result, it can be used with a pithiness and brevity unknown in English (see INFLECTION). It also lends itself to elaboration, because its tight syntax holds even the longest and most complex sentence together as a logical unit. Latin can be used with striking conciseness, as in the works of Sallust and Tacitus. Or it can have wide, sweeping phrases, as in the works of Livy and the speeches of Cicero.

Latin lacks the rich poetic vocabulary that marks Greek poetry. Some earlier Latin poets tried to make up for this deficiency by creating new compound words, as the Greeks had done. But this system did not fit Latin, and purists such as Julius Caesar kept it from becoming popular. As a result, the great poets of the period from 50 B.C. to A.D. 50 usually used simple, everyday words and phrases. The words take on poetic coloring from (1) their metrical position within the verse, (2) the shadings given them by a new context, and (3) the poetry of the passage as a whole. To create great poetry from the raw material of the Latin vocabulary required painstaking work as well as poetic inspiration. The greatest Latin poets wrote poems with such perfect technique that we sometimes forget that these works are the product of immense labor.

Latin moves with impressive dignity in the writings of Lucretius, Cicero, or Virgil. It reflects the seriousness and sense of responsibility that characterized the ruling class of Rome during the great years of the republic. But the Romans could also relax and allow what Horace called the "Italian vinegar" in their systems to pour forth in wit and satire.

Many persons find much of the beauty of Latin poetry and prose in its purity and musical sound. Latin, like Italian today, has a separate sound for each vowel. It does not have the indistinct sounds that pass for vowels in the unaccented syllables of many English words. The best Latin writers arranged pure sounds in patterns that strike the ear with musical cadence.

Latin in Translation. The best Latin literature has been translated into most major languages. In general, there are two kinds of translations, poetic and literal. *Poetic* translations try to preserve the spirit and beauty of the original Latin poem without much concern for its actual words. For example, John Dryden translated all the works of Virgil into English heroic couplets—not their original form, but a close English equivalent. Artistic prose versions also try to reflect the style of the original. *Literal* translations of poetry or prose tell exactly what the Latin writer said, but usually lose the beauty and style that made the originals works of art.

Early Latin Literature

Formal Latin literature began in 240 B.C., when a Roman audience saw a Latin version of a Greek play. The Greek author, Livius Andronicus (284?-204? B.C.), also translated Homer's *Odyssey* into an old type of Latin verse known as the Saturnian measure. Latin literature independent of Greek models first appeared with the poet Gnaeus Naevius (270?-201? B.C.), who may be considered the father of Roman literature. He wrote an epic on the first Punic War. His dramas were mainly reworkings of Greek originals. But he also created a form of tragedy purely Roman in content, and his comedies had a strong Italian flavor.

Other epic poets followed Naevius. Quintus Ennius (239-169 B.C.) wrote an historical epic, the *Annals*, describing Roman history from the founding of Rome to his own time. He adopted Greek dactylic hexameter, which became the standard verse form for Roman epics. He also became famous for his tragic dramas. In this field his most distinguished successors were Marcus Pacuvius (220-130? B.C.) and Lucius Accius (170-85? B.C.). These three rarely used episodes from Roman history. Instead they wrote Latin versions of tragic themes that the Greeks had already handled. But even when they copied the Greeks, they did not translate slavishly. Only fragments of their plays have survived.

We know much more about early Latin comedy, because we have 20 complete plays by Plautus (254?-184? B.C.) and 6 by Terence (195?-159? B.C.). These men modeled their plays on Greek comedies of the so-called New Period. But they treated the plots and wording of the originals freely. Plautus scattered songs or operatic arias through his plays, making them distinctive among Roman comedies. The music, like almost all ancient music, has been lost. But the songs clearly show the love of singing that still marks Italian life today.

The prose of this period is best known through *De agri cultura*, a work on farming by Cato the Elder (234-149 B.C.). Cato wrote the first Latin history of Rome and other Italian cities. In many ways, he was also the founder of formal Roman oratory. The fragments of his speeches show that he knew a number of rhetorical devices later developed by Cicero.

Early Latin literature ends with Gaius Lucilius (180?-102? B.C.). He created a new kind of literature in his 30 books of *Satires*, for which no immediate Greek model can be found. He criticized the social scene in sophisticated, witty, and often biting verse.

The Golden Age

Latin literature reached its period of greatest art from 106 B.C. to A.D. 14—that is, from the birth of Cicero to the death of the emperor Augustus.

The Age of Cicero. Cicero (106-43 B.C.), the greatest master of Latin prose, dominated Latin literature during his lifetime. His many writings can be divided into four groups: (1) letters, (2) rhetorical treatises, (3) philosophical works, and (4) orations. His letters provide detailed information about an important period in Roman history. They also contain choice examples of the colloquial style that educated Romans used in their correspondence. Cicero's treatises are our most valuable works on ancient rhetorical theory. His philosophical works stood as a cornerstone of ancient learning in the Middle Ages. They included most of what medieval scholars knew of Greek philosophy. And his orations still serve as models of Latin prose.

Sallust (86-34 B.C.) and Julius Caesar (100?-44 B.C.) were also outstanding prose writers of Cicero's time. Sallust adopted a concise, pointed style in his historical works. He wrote brilliant descriptions of people and their motives. Caesar wrote commentaries on the Gallic and civil wars in a simple style with the sure touch of a literary master.

This same period saw the birth of lyric poetry in Latin. The love poems of Catullus (84?-54 B.C.) have never been surpassed in emotional intensity. He and others of his group also introduced into Latin literature the *epyllion*, or short epic, which emphasized formal perfection. In contrast to these "moderns," the poet Lucretius (94?-55 B.C.) undertook to interpret the philosophy of Epicurus. His work, called *De rerum natura*, contains many sublime passages. It is a triumph of poetic genius over unpoetic matter.

The most learned writer of the period was Varro (116-27 B.C.). Scholars estimate that he wrote 74 works in 620 books. He covered almost every conceivable subject, from agriculture to poetry. Unfortunately, his work on agriculture and 6 of his 25 books on the Latin language are his only complete works that remain.

The Age of Augustus. The emperor Augustus took a personal interest in the literary works produced during his reign. This period by itself is sometimes called the golden age of Latin literature. Virgil (70-19 B.C.) published his pastoral *Eclogues;* the *Georgics*, perhaps the most beautiful poem ever written about country life; and the *Aeneid*, an epic poem describing the events that led to the creation of Rome. Virgil tells how the Trojan hero Aeneas became the ancestor of the Roman people, and provides divine justification for Roman rule over the world. Although Virgil died before he could put the finishing touches on his poem, it was soon recognized as the greatest work of Latin literature. Critics still agree on this judgment.

Virgil's friend Horace (65-8 B.C.) wrote *Epodes*, *Odes*, *Satires*, and *Epistles*. The perfection of the *Odes* in content, form, and style has charmed readers for hundreds of years. The *Satires* and *Epistles* discuss ethical and literary problems in an urbane and witty manner. Horace's *Art of Poetry*, probably published as a separate work, greatly influenced later poetic theories. It stated the fundamental rules of classical writing as the Romans understood and used them. After Virgil died, Horace was Rome's leading poet.

The Latin elegy reached its highest development in the works of Tibullus (48?-19 B.C.), Propertius (50?-16? B.C.), and Ovid (43 B.C.-A.D. 17?). Most of this poetry is concerned with love (see ELEGY). But we remember Ovid most for his *Metamorphoses*, which served as a reference work on mythology for hundreds of years.

In prose, Livy (59 B.C.-A.D. 17) produced a history of the Roman people in 142 books. Only 35 survive, but they are a major source of information on Rome.

Later Latin Literature

The Imperial Period. From the death of Augustus in A.D. 14 until about 200, Roman authors emphasized style, and tried new and startling ways of expression. The Stoic philosopher Seneca (4? B.C.-A.D. 65) composed nine tragedies and several ethical works. His nephew Lucan (39-65) wrote the *Pharsalia*, an epic poem describing the civil war between Caesar and Pompey. The *Satyricon* of Petronius, who died in A.D. 66, provides remains of the first realistic novel in Western literature. It describes lower-class life.

Epic poems included the *Argonautica* of Valerius Flaccus, who died about 92, the *Thebaid* of Statius (45?-96), and the *Punica* of Silius Italicus (26?-101?). At the hands of Martial (40?-104?), the epigram achieved the stinging quality still associated with it. Juvenal (60?-140?) brilliantly satirized vice.

Among prose writers, the historian Tacitus (55?-120?) probably deserves first place. He painted an unforgettably dark picture of the early empire in his *Histories* and *Annals*. His contemporary Suetonius (69?-140) wrote biographies of the 12 Roman rulers from Julius Caesar through Domitian. The letters of Pliny the Younger (61-113?) described Roman life of the period. Quintilian (40?-95?) composed the most complete work on ancient education that we possess. Important works from the 100's include the *Attic Nights* of Aulus Gellius (123-165), a series of essays containing much valuable information on Roman life and literature not preserved elsewhere; the letters of the rhetorician Fronto (100?-166?); and a remarkable tale of adventure, *The Golden Ass*, by Lucius Apuleius.

Later Periods. Pagan Latin literature showed a final burst of vitality in the 300's and 400's. Ammianus Marcellinus (330?-395?) in history, Symmachus (340?-402) in oratory, and Ausonius (310?-394?) and Rutilius (early 400's) in poetry all wrote with great talent. The *Mosella* by Ausonius has a modernism of feeling that indicates the end of classical literature as such.

At the same time, other men laid the foundations of Christian Latin literature. They included the church fathers, Augustine (354-430), Jerome (about 340-420), and Ambrose (339-397), and the first great Christian poet, Prudentius (born about 348).

HENRY T. ROWELL

Related Articles in WORLD BOOK include:

Ambrose, Saint
Augustine, Saint
Caesar, Gaius Julius
Cato
Catullus
Cicero
Horace
Jerome, Saint
Juvenal
Livy
Lucretius
Marcus Aurelius
Martial
Ovid
Petronius
Plautus
Pliny
Quintilian
Sallust
Seneca
Suetonius
Tacitus
Terence
Virgil

LATIN QUARTER. See PARIS (Education).

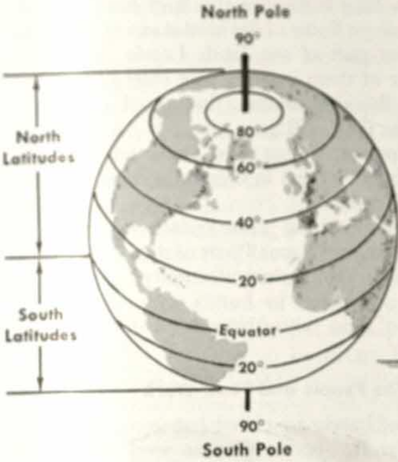
LATIN SCHOOL. See COLONIAL LIFE IN AMERICA (Education); HIGH SCHOOL (Development).

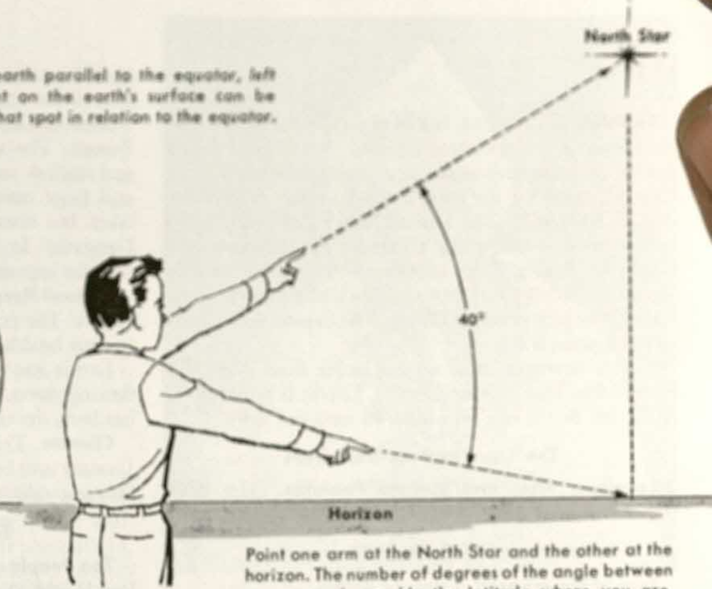
LATINUS. See AENEID.

LATISSIMUS DORSI. See MUSCLE (picture).

LATITUDE

Imagine a series of lines running around the earth parallel to the equator, left below. These are lines of *latitude.* Every point on the earth's surface can be located on such a line. It shows the position of that spot in relation to the equator.





Point one arm at the North Star and the other at the horizon. The number of degrees of the angle between your arms is roughly the latitude where you are.

LATITUDE, *LAT ih tyood,* describes the position of a point on the earth's surface in relation to the equator. Latitude is one of the two *coordinates* that locate any point on the earth. The other coordinate is longitude (see LONGITUDE).

The latitude of a point is measured along the *meridian,* or imaginary north-south line, that runs through it (see MERIDIAN). Latitude is measured in degrees. A point on the equator has a latitude of zero degrees (written 0°). The North Pole has a latitude of 90° *north* and the South Pole has a latitude of 90° *south.* These are sometimes written +90° and −90°. Degrees of latitude are divided into 60 *minutes* (′), and the minutes consist of 60 *seconds* (″).

All points on the earth's surface that have the same latitude lie on an imaginary circle called a *parallel of latitude.* The distance between two parallels that are 1° apart is about 69 *statute* (land) miles or 60 *nautical* (sea or air) miles (see MILE). This length of 1° of latitude varies from 68.7 statute miles near the equator to 69.4 statute miles near the poles. The variation results from the fact that the earth is not a perfect sphere. A difference in latitude of 1 minute equals about 1 nautical mile. WILLIAM MARKOWITZ

See also EQUATOR; MAP.

LATIUM, *LAY she um,* was the part of ancient Italy that lay along the coast of the Mediterranean Sea, southeast of Etruria and northwest of Campania. Its chief cities formed a league that waged war against the Romans from 340 to 338 B.C. The Romans won, and Latium became a part of Rome. The modern Campagna di Roma, which surrounds Rome, covers about the same territory as Latium. WILLIAM SCOTT FERGUSON

LATONA. See NIOBE.

LA TOSCA. See OPERA (Some of the Famous Operas).

LA TRAVIATA. See OPERA (Some of the Famous Operas).

LATROBE, BENJAMIN HENRY (1764-1820), an American architect and engineer, pioneered Greek Revival architecture in America. The Bank of Pennsylvania was one of his major works. In 1803, President Thomas Jefferson appointed Latrobe as chief architect of the U.S. Capitol. After the Capitol burned during the War of 1812, Latrobe served again as architect. He designed the Baltimore Cathedral, docks, and water systems. Latrobe was born in Yorkshire, England, and attended the University of Leipzig. HUGH MORRISON

LATTER DAY SAINTS, REORGANIZED CHURCH OF JESUS CHRIST OF, is a religious denomination formed by members of the original Church of Jesus Christ of Latter-day Saints. The Reorganized Church rejected the doctrine of polygamy introduced by Brigham Young in 1852 (see POLYGAMY). It maintained that Joseph Smith, Jr., founder of the church, did not teach or practice polygamy.

The Reorganized Church bases its teachings on the Bible, as the source of moral and spiritual law; the *Book of Mormon;* and modern revelation, as published in the *Book of Doctrine and Covenants.* It stresses the ideals of Christian community life and stewardship. It also maintains the practice of *tithing,* whereby members contribute one tenth of their net income to the church.

The church claims succession from the original church founded by Joseph Smith, Jr., in 1830; and the federal court has upheld this claim. The church was reorganized in the 1850's, with Joseph Smith III as president from 1860 to 1914. His sons succeeded him in office in the following order: Frederick M. Smith, 1915-1946; Israel A. Smith, 1946-1958; and W. Wallace Smith, the present head. The church has a world membership of 175,000. It has followers in Australia, Canada, Denmark, France, French Polynesia, Germany, Great Britain, Japan, Korea, The Netherlands, New Caledonia, New Zealand, Norway, Sweden, and the United States. Its headquarters are in Independence, Mo. For membership of the Reorganized Church of Jesus Christ of Latter Day Saints in the United States, see RELIGION (table). W. WALLACE SMITH

See also MORMONS; SMITH, JOSEPH; YOUNG, BRIGHAM.

LATTER-DAY SAINTS, THE CHURCH OF JESUS CHRIST OF. See MORMONS.

LATTICINIO. See GLASSWARE.

LATVIA, *LAT vih uh,* is a land on the Baltic Sea that once was an independent country. But Russia seized Latvia in 1940 and made it a communist state. The Russian name for the state is the LATVIAN SOVIET SOCIALIST REPUBLIC. The United States and many other countries do not officially recognize the annexation of Latvia by Russia. They continue to recognize the diplomats and consular representatives who function in the name of an independent Latvia. The capital and largest city of Latvia is Rīga.

Latvia covers an area a little larger than West Virginia. Most Latvians are farmers. Latvia is hundreds of years old. But it has kept alive its national spirit.

The Land and Its Resources

Location, Size, and Surface Features. The *Map* shows that Latvia is in northern Europe between Estonia and Lithuania. The Baltic Sea and the Gulf of Rīga are west of the country. Latvia covers 24,600 square miles.

Most of Latvia is part of the coastal plain of northern Europe. The rolling surface of the land has low hills and shallow valleys. Some of the land is sandy. Swamps and bogs cover part of the land. Latvia has many lakes, but none of them is large. The chief river is the Daugava. It flows northwest through Latvia and empties into the Gulf of Rīga.

Natural Resources. Forests cover about one fourth of Latvia. The country is rich in mineral springs, and has famous health resorts.

Latvia has great natural power resources in its swift-flowing rivers. But only a small part of this water power has been developed to produce electricity.

Climate. Temperatures in Latvia average 20°F. in January and 60°F. in July. About 20-40 inches of rain falls annually.

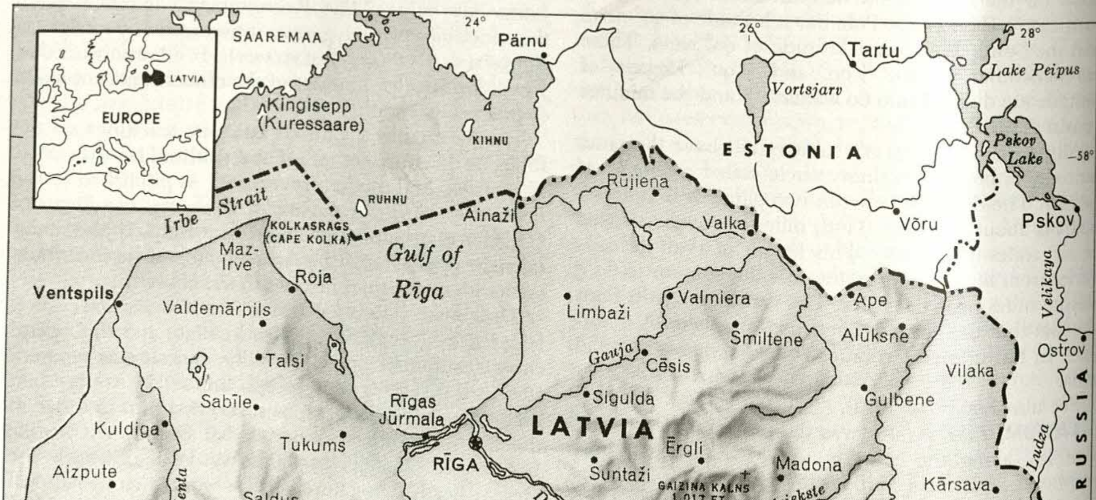
FACTS IN BRIEF

Type of Government: A state of Russia.
Capital: Rīga.
Area: 24,600 square miles. *Greatest distance:* (east-west) 270 miles; (north-south) 130 miles. *Coast line,* 307 miles.
Elevation: *Highest,* 1,017 feet, about 70 miles east of Rīga; *lowest,* sea level.
Population: 2,094,000. *Density,* about 84 persons to the square mile. *Distribution,* rural, 83 per cent; urban, 17 per cent.
Chief Products: *Agriculture,* barley, bees, cattle, flax, horses, oats, pigs, potatoes, poultry, rye, sheep. *Manufacturing and Processing,* chemicals, lumber products, machinery, textiles.

The People and Their Work

The People of Latvia are called *Latvians* or *Letts.* Before World War II, about 1,500,000 were of Latvian origin. Many of the rest were Jews, Russians, and Germans. The Jews, the Germans, and half a million Latvians were killed or driven from the country during the war. More than 100,000 Latvians still are refugees. Many persons came to Latvia from other parts of Russia after World War II. See LETT.

The Latvian language is one of the oldest languages spoken in Europe. It belongs to the same Baltic group of languages as Lithuanian. It is related to Sanskrit, and to the Slavic, Latin, and Greek languages. All



Latvians are now required to learn Russian, and must use it whenever possible.

Way of Life. Most Latvians live in the country, away from the cities and towns. Some of them live in ancient, picturesque timber houses covered with thatch and straw. Some of the houses are made of hand-cut, rounded logs.

The Latvians are hard-working people, but they enjoy holiday festivals and singing. Communist celebrations have replaced many of Latvia's old holidays.

One of the chief Latvian holidays is St. John's Eve. It is celebrated on June 23 in honor of the beginning of summer. Another festival is St. Martin's Day, which falls on November 10. It is somewhat like Halloween in the United States. The young people wear masks that often are in the shape of animals' heads.

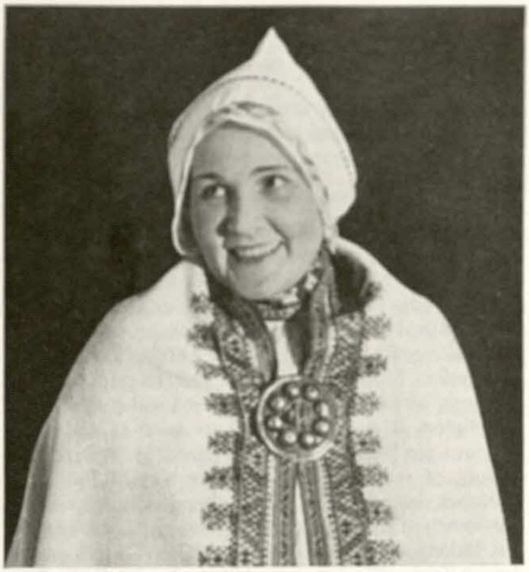
Cities. Rīga (pop. 605,000) is the capital of Latvia, Liepāja (pop. 71,000) is an important Baltic seaport, and Daugavpils (pop. 65,000) is a leading inland trading center. Other cities, together with their populations, include Jelgava (35,000); Rēzekne (27,000); Ventspils (26,200); Valmiera (15,200); Tukums (14,800); Cēsis (8,500); and Kuldiga (7,000).

Agriculture. More than half the Latvian people are farmers. The soil is fairly rich, and is highly cultivated so that it will produce large crops. The chief crops are oats, barley, rye, potatoes, and flax. Many Latvians are dairy farmers. Poultry, sheep, cattle, and pigs are numerous. About 100 farms raise race horses. Honey from beehives is another important source of income.

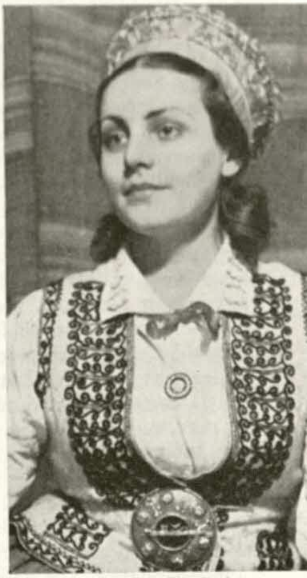
After the communists seized Latvia, they forced the farmers to work on *kolkhozy*, or collective farms. All land was declared to be government property. By 1952, about 98 per cent of the farms had been combined to form 1,500 collective farms. There also are 50 Russian state farms. Several machine-tractor and horse-hiring stations help the farmers.

Manufacturing. After Latvia was seized by Russia, its industries were taken over by the government. Latvia's chief industries produce textiles, chemicals, machinery, and lumber products.

Transportation and Communication. Latvia has about 1,900 miles of railroad tracks, and many miles of



Married Women in Latvia wear bonnet headdresses. Large metal ornaments are part of the traditional costume of all Latvian women.



Unmarried Women in Latvia wear bright-colored headdresses. Many Latvian women wear sleeveless jackets that are decorated with braid.

Klinsky, Pix; Pix; Sovfoto

Collective Farms were introduced to Latvia when the communists took over the country. The Russians have mechanized many agricultural operations, such as plowing.

highways. Rīga is the second largest port on the Baltic Sea. Only Leningrad is larger. Telephone and telegraph lines link the major cities and towns.

Social and Cultural Achievements

Education is controlled by the Russian government. There are about 302,000 pupils in primary and secondary schools. More than half the teachers are non-Latvians who have had no training except in communist political courses. About 13,000 students attend institutions of higher learning in Latvia. The Latvian University, founded in 1919, and an Academy of Sciences, which opened in 1947, are located in Rīga.

Religion. The communists have tried to stamp out religious services and Christian practices. Before 1940, six out of ten Latvians were members of Protestant churches, especially of the Lutheran Church. About one fourth of the Latvians were Roman Catholics. The rest belonged to the Greek Orthodox Church or the Jewish faith. The Germans killed almost all the Jews during World War II.

History

Early Years. Scientists believe that people lived in Latvia as long ago as 3000 B.C. Hundreds of years later, groups of Latvians began to establish settlements on the shores of the Baltic Sea. They carried on a brisk trade with Scandinavians, Romans, Arabs, Slavs, and Anglo-Saxons.

By the 700's, the Latvians had built a chain of frontier forts to protect their land. In the 1200's, the Teutonic Knights, led by Albert of Bremen, swept into Latvia from Germany. War between the Latvians and the Germans continued for almost a hundred years, until the Latvians surrendered. See TEUTONIC KNIGHTS.

Germans controlled Latvia until 1561. In that year, Latvia came under the rule of Poland and Lithuania. In 1621, northern Latvia, or *Livonia*, as it was called, was annexed by Sweden. Russia annexed this region in 1710. Two years later, the Russian Czar, Peter the Great, married a beautiful Latvian girl named Martha Svibul. After the Czar's death, she reigned from 1725 to 1727 as Catherine I, Empress of Russia.

Independence. The Russians controlled Latvia until the Russian Revolution in 1917. The Latvians proclaimed their country an independent republic on November 18, 1918. For two more years, they fought to make Germany and Russia recognize their liberty.

Before 1920, a few wealthy persons owned most of the land of Latvia. But, in 1920, farm-reform laws broke up the great estates. The land was divided into small farms and distributed to the people who formerly had been tenants or renters on the estates. Much church and government land also was divided and sold.

The Latvian assembly met in 1920 to write the constitution which went into effect in 1922. Also in 1922, the country elected Janis Čakste (1859-1927) as its first president.

Soviet Rule. Germany and Latvia signed a nonaggression pact in May, 1939. In October of that year, Latvia was forced to sign a treaty with Russia. This treaty gave the Russians three Latvian ports to use as naval bases, and pledged that each nation would support the other. In June, 1940, Russia invaded Latvia. Russia annexed Latvia in August.

German forces invaded Latvia in 1941, and occupied it until 1944. Toward the end of 1944, Russian troops drove the Germans out of Latvia.

The Russians put down an attempt to set up another "free" Latvian government. They re-established Latvia as one of the states of Russia. By the 1950's, all Latvians who had held high government posts had been replaced by Russian officials.

FRANCIS J. BOWMAN

Related Articles in WORLD BOOK include:

Baltic States
Estonia
Lett
Liepāja
Lithuania
Rīga

LAUBACH, *LAW bahk,* **FRANK CHARLES** (1884-), an American missionary, preacher, and educator, won world fame for teaching illiterate peoples to read. His system used symbols to represent phonetic sounds. Laubach first used the system while serving as a missionary in the Philippines from 1915 to 1936. Governments of many countries later sponsored his program. Laubach was co-author of more than 200 primers for illiterate adults in over 165 languages. "Each one teach one" became one of his principles. He was born in Benton, Pa.

GALEN SAYLOR

LAUD, *lawd,* **WILLIAM** (1573-1645), was the dominating figure in the Church of England during the struggle between King Charles I and the Puritan-controlled Parliament. Charles became king in 1625, and in 1633 appointed Laud as Archbishop of Canterbury.

Laud believed that, since the Church of England was the national church, all Englishmen should belong to it. He directed his efforts to enforce uniformity in religion mainly against the Puritans. Laud was too impatient to try persuasion. Instead, he gathered together all the legal machinery of church and state and used it against the Puritans. He ordered no one put to death, but he permitted cruel punishments. These measures aroused widespread anger against both Laud and King Charles, which eventually led to civil war. In 1641, Laud was arrested and tried for treason. No evidence supported this charge, but Parliament passed a bill of attainder condemning him to death. He was beheaded in 1645.

Laud was born in Reading, England, and attended St. John's College, Oxford University. He became a clergyman and rapidly rose to prominence under the rule of King Charles I.

GEORGE L. MOSSE

LAUDANUM, *LAW duh num,* is a drug formerly used to reduce pain. It is really a tincture of opium, and is made by softening powdered opium in water and then in alcohol. The liquid portion is then strained off. Laudanum is dark brownish-red and smells like opium. It is a habit-forming drug, and should be taken only by physician's prescription In case of an overdose of laudanum, the patient's stomach should be cleansed immediately by a stomach pump or by some substance to produce vomiting. Walking the patient about and giving him strong coffee as a stimulant also help counteract the effects of laudanum. Artificial respiration may be necessary when a large amount of laudanum is consumed.

Laudanum was first prepared and named by the early Swiss physician Paracelsus. The name comes from the Latin term for a resinous gum.

AUSTIN EDWARD SMITH

See also OPIUM; PARACELSUS, PHILIPPUS AUREOLUS.

Wide World

Sir Harry Lauder

LAUDER, *LOU der*, **SIR HARRY** (1870-1950), became one of the world's most beloved entertainers. For more than 40 years he delighted audiences with character sketches and Scottish-dialect songs such as *It's Nice To Get Up in the Mornin' (But It's Nicer To Lie in Yer Bed)*. Lauder wrote all his own material and always appeared alone on the stage. He recorded many of his songs and stories. Lauder was born at Portobello, Scotland (now part of Edinburgh). He began his career by singing at parties. NARDI REEDER CAMPION

LAUE, *LOU uh*, **MAX THEODOR FELIX VON** (1879-1960), a German physicist, received the 1914 Nobel prize in physics for his research in X-ray diffraction. Von Laue discovered that X rays might be diffracted, or bent, by certain crystals such as rock salt. This made it possible to measure the wave lengths of X rays and to study the relative position of atoms within a crystal. He also made contributions to the theory of relativity. Von Laue was born at Pfaffendorf, Germany. He received his doctorate from the University of Berlin. RALPH E. LAPP

LAUGH. See HUMOR.

LAUGHING GAS. See NITROUS OXIDE.

LAUGHING JACKASS. See KOOKABURRA.

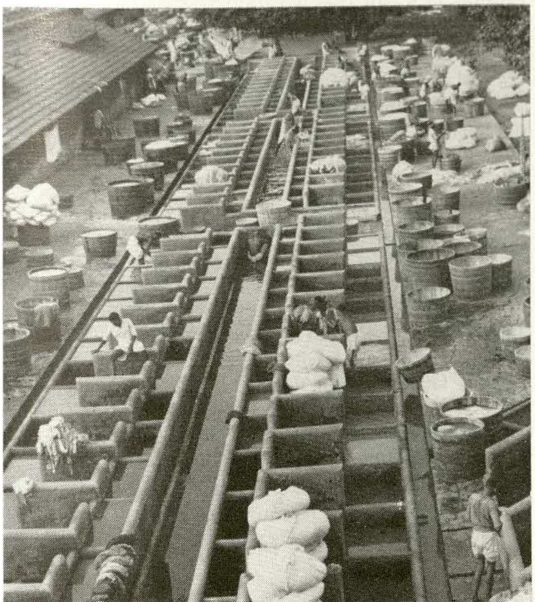
LAUGHTON, CHARLES (1899-), an American actor, gained fame for his character portrayals on the stage and in motion pictures. Laughton enjoyed success almost from the beginning of his career. He appeared in such plays as *The Cherry Orchard*, *Alibi*, and *The Man with the Red Hair*. His film roles included those in *Mutiny on the Bounty*, *Ruggles of Red Gap*, and *The Private Life of Henry VIII*. Laughton was born in Scarborough, England, but he later became an American citizen. HARRIET VAN HORNE

LAULAU. See HAWAII (The People).

LAUNDRY is a place where clothing and linens are washed. The soiled clothing and linens to be washed are also called *laundry*.

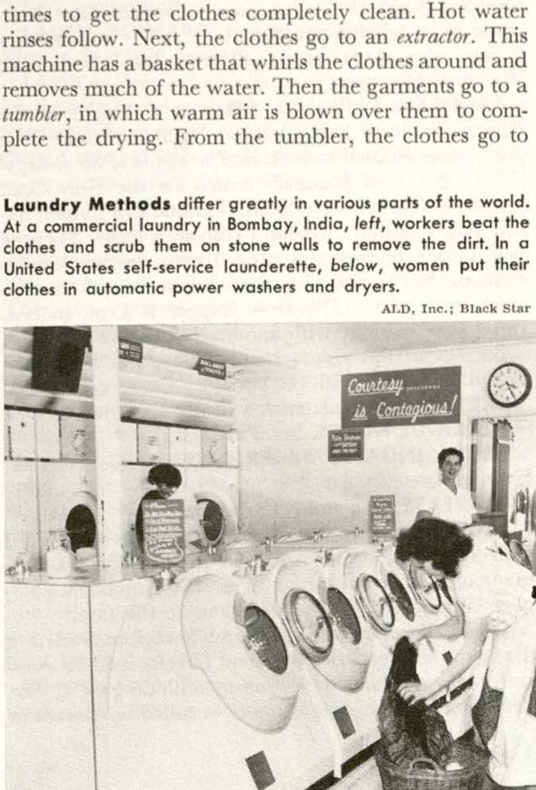
Home Laundering. Hundreds of years ago, most people washed their clothes in rivers or smaller streams. The women soaked the clothes in water, then beat them with sticks or scrubbed them on rocks to remove the dirt. More recently, women spent long hours scrubbing clothes on washboards. In some parts of the world, these old laundry methods still are used. But many housewives in the United States and Canada today can turn on an automatic electric washing machine that removes the dirt from clothes easily and quickly. The housewife may also have an automatic clothes dryer, or drier. This machine has a gas or electric heating unit to warm the air that dries the clothes. Probably the housewife also owns an electric iron with which she presses the clothes. With a steam iron, the clothes do not even need to be dampened. Some homes have a mangle, or electric ironer, a device equipped with rollers. The mangle is especially helpful for pressing flatwork, such as bed linens and towels.

Commercial Laundries. After a customer sends a bundle of clothes to a laundry, several steps take place in different departments. After the laundry has been marked for identification, workers sort the clothes according to the kind of material and the color. Then the clothes go to the *wash wheels*, or washing machines. There are many sizes of wash wheels. The largest can hold about 1,500 pounds of laundry. The rotating cylinders in the washing machines swish the clothes about in soap or *detergent* (a synthetic cleaning agent) and water until they are clean. The soap or detergent and water in the machine may be changed five or six times to get the clothes completely clean. Hot water rinses follow. Next, the clothes go to an *extractor*. This machine has a basket that whirls the clothes around and removes much of the water. Then the garments go to a *tumbler*, in which warm air is blown over them to complete the drying. From the tumbler, the clothes go to



Laundry Methods differ greatly in various parts of the world. At a commercial laundry in Bombay, India, *left*, workers beat the clothes and scrub them on stone walls to remove the dirt. In a United States self-service launderette, *below*, women put their clothes in automatic power washers and dryers.

ALD, Inc.; Black Star



different departments, depending on the kind of service desired, and the particular item. Shirts are ironed on special presses, each designed for a certain part of the shirt. Flatwork is ironed on heated rollers.

Special Laundries. Laundries provide many special services. Linen supply houses wash and iron linens for restaurants and other establishments. Institutions such as hospitals usually have their own laundries. The diaper laundry service supplies and launders diapers. Self-service laundries, sometimes called *launderettes*, came into wide use during the 1940's and 1950's. These laundries have individual automatic washing machines. In some launderettes, the customer inserts a coin and waits while the machine washes the clothes. In others, employees attend the machines. There are more than 12,000 launderettes in the United States.

The Laundry Industry in the United States includes more than 7,800 commercial power laundries, not including special-type laundries. These laundries employ over 311,000 persons and do a yearly business in excess of $1,000,000,000. There also are about 10,000 hand laundries. The American Institute of Laundering at Joliet, Ill., operates research laboratories and a school.

History. No one knows when commercial laundries started. The Romans sent clothes to commercial laundries as long as 2,000 years ago. During the Middle Ages, the woolen clothing that everyone wore usually was never washed, and laundries all but disappeared.

The laundry as we know it today owes its start to the California gold rush of 1849. A miner named Davis failed to find any gold. He had to make his living in some way, so he started a laundry near Oakland, Calif. Davis first washed the clothes in a barrel. Then Charles Mattee designed a crude wooden wash wheel for him. Since that time great advances have been made in laundering equipment. GENE BENNETT

See also APPLIANCES; BLUING; DRY CLEANING; WASHING MACHINE.

LAUNFAL, *LAWN fal*, **SIR,** was a knight of the Round Table in King Arthur's legendary court. The poet James Russell Lowell, in *The Vision of Sir Launfal* (1848), described Launfal's search for the Holy Grail (see HOLY GRAIL). In a dream, Launfal saw himself setting out, scornfully tossing a coin to a leper. Then he saw himself returning as an old man, having lost his earldom. But he shared a crust and water with another leper, who said, "The Holy Supper is kept, indeed, In whatso we share with another's need."

Because of this vision, Launfal stayed at home and shared his wealth with the poor. KNOX WILSON

LAUNOY. See HELICOPTER (Early Experiments).

LAURA DE NOVES. See PETRARCH.

LAURA INGALLS WILDER AWARD. See WILDER, LAURA INGALLS.

LAUREATE. See POET LAUREATE.

LAUREL is a family of trees and shrubs known for their spicy odor. They grow in tropical regions, and many are important timber trees. The cinnamon, camphor, avocado, and sassafras belong to this family.

Grecian laurel, or *sweet bay*, grows in regions bordering the Mediterranean Sea. Ancient Greeks used its evergreen leaves to crown victors in athletic games. The *California laurel*, or *Oregon laurel*, is called *myrtlewood* in some regions. It grows along the Pacific Coast of North America. Its rich, light-brown wood is strong and close-grained. The wood is valued for furniture, for finishing home interiors, and for woodcarving.

Plants of other families are also called laurels. *Cherry laurel*, or *English laurel*, is a group of evergreen cherry trees in the rose family. The beautiful *mountain laurel* is the state flower of Connecticut and Pennsylvania. It is in the heath family.

Scientific Classification. Laurels make up the family *Lauraceae*. Grecian laurel is genus *Laurus*, species *nobilis*. Cherry laurel is *Prunus laurocerasus*. Mountain laurel is *Lamia latifolia*. ELBERT L. LITTLE, JR.

Related Articles in WORLD BOOK include:

Avocado
Bay Tree
Camphor
Leaf (pictures, Kinds [California Laurel]; The Laurel Leaf)
Mountain Laurel
Sassafras

LAUREL, Miss. (pop. 27,889; alt. 245 ft.), founded as a sawmill town in 1882, has grown into one of the state's leading industrial centers. It stands on the northeastern edge of the vast yellow pine forest of southern Mississippi (see MISSISSIPPI [map]). Manufactures include lumber and wood products, turpentine and resin, refrigeration equipment, milk dispensers, and garments. Oil fields opened northeast of Laurel in 1944, and a refinery was built nearby in 1945. Oil was discovered inside the city in 1958. Laurel has a commission form of government. CHARLOTTE CAPERS

LAURENCIN, *LOH RAHN SAN*, **MARIE** (1885-1956), a French painter, became noted for her pictures of women, usually done in delicate, flat tones of pink and gray. Her early work was influenced by Toulouse-Lautrec and the cubism of Pablo Picasso. She later developed a feminine decorative style, and painted many pictures of beautiful young women with pale faces and dark eyes. She also produced prints and posters, and designed settings for ballets and the stage. Miss Laurencin was born in Paris. GEORGE D. CULLER

LAURENT, ROBERT. See SCULPTURE (Sculpture of Today).

LAURENTIAN PLATEAU, or **CANADIAN SHIELD.** See CANADIAN SHIELD.

LAURENTIAN REVOLUTION. See GEOLOGY (table, Outline of Earth History).

LAURIER, *LAW rih ay*, **SIR WILFRID** (1841-1919), served as Prime Minister of Canada from 1896 to 1911. He was the first French Canadian to hold that position. The consolidation of the Canadian federation, the opening of the Canadian West, and wide economic expansion and prosperity took place during his term of office.

Laurier's government adopted a vigorous policy for the development of the West. His government carried on an energetic campaign to attract settlers, and thousands came to Canada from Great Britain, central Europe, and the United States. In 1905, the two provinces of Alberta and Saskatchewan were organized, and two transcontinental railways, the Canadian Northern and the Grand Trunk Pacific, were constructed. Both railways later joined together to become the Canadian National Railways under government control.

Relations with the United States grew increasingly important at this time. Laurier's government agreed to the formation of the commission which settled the Alaska boundary controversy in 1903. Both Laurier and

Brown Bros.

Sir Wilfrid Laurier

the Canadian people regarded the decision of this commission unfavorably. But both the 1910 Hague Tribunal settlement of the fisheries dispute and the establishment of the International Joint Commission on boundary waterways were favored. In 1911, Laurier concluded a trade agreement with the United States providing for a wide measure of reciprocal trade. This agreement met with strong opposition, and in the election of 1911 Robert Borden defeated Laurier.

World War I. Although Laurier opposed extensive commitments to the British Empire, he sent Canadian troops to fight in the Boer War in 1899. In 1914, he loyally supported Canadian participation in World War I. But he did not favor the military draft in 1917. Other members of his party supported this measure, but Laurier opposed it until his death.

Laurier was essentially a Canadian nationalist. During his administration, the practice of an English officer commanding the Canadian Militia was stopped. Laurier's government also passed the Naval Service Act in 1910, which founded the Royal Canadian Navy. It was the tragedy of his life that he died during the bitterness and strife which followed the introduction of the draft during World War I. This dispute divided the two language groups of Canada, whose points of view Laurier had tried to bring together.

His Life. Laurier was born in St. Lin, Quebec. He was educated at L'Assomption College and McGill University. As valedictorian of his class, he appealed for sympathy and understanding between the French and English in Canada. He followed this policy throughout his political career.

A lawyer and a journalist, Laurier was elected to the provincial legislature of Quebec in 1871. He became a member of the Canadian House of Commons in 1874. Recognized as an able orator, he became a member of Alexander Mackenzie's cabinet in 1877. In 1887, he was chosen leader of the Liberal party. He became prime minister in 1896, when he defeated Sir Charles Tupper and the Conservatives on the issue of church schools in Manitoba. G. F. G. STANLEY

See also CANADA, HISTORY OF (The Struggle for Unity).

LAUSANNE, *loh ZAN* (pop. 113,200), is a tourist center less than a mile from Lake Geneva in Switzerland. For location, see SWITZERLAND (color map). The city was built on and around five hills. A high viaduct, or road built up over the valley, connects two of the hills. The city has a fine view of the lake and the mountains.

A beautiful 700-year-old Gothic cathedral is one of Lausanne's landmarks. An ancient castle stands close to the cathedral. Many of the old buildings in Lausanne were torn down or greatly changed when the city was improved and modernized. Lausanne became important industrially after the Simplon Tunnel opened in 1906. The city is known as an educational center. The University of Lausanne, founded as an academy in 1537, became a university in 1891. FRANKLIN C. ERICKSON

LAUSANNE, TREATY OF, ended conflicts between Turkey and the countries of Europe. It was signed at Lausanne, Switzerland, in 1923, and set aside the Treaty of Sèvres, forced upon Turkey in 1920. The Turks had never really accepted the terms of the first treaty. They did not mind giving up non-Turkish territories, such as Syria, Palestine, Iraq, and Arabia. But they objected to such provisions as Greek possession of Smyrna (now Izmir) and the presence of foreign troops in Turkey. Kemal Atatürk led Turkish troops in driving the Greeks out of Izmir, then faced British troops at the Dardanelles. The European powers quickly negotiated the Treaty of Lausanne. They gave Turkey Izmir and other territories in Asia Minor, and removed foreign troops from Turkey. Turkey gave up Rhodes and the Dodecanese Islands to Italy and the Aegean Islands and some of Thrace to Greece. Greeks were ordered out of Turkey, and Turks out of Greece. NORMAN D. PALMER

See also GREECE (After World War I); IZMIR; KEMAL ATATÜRK; SÈVRES, TREATY OF; TURKEY (After World War I).

LAUSANNE CONFERENCE. See WAR DEBT.

LAUSCHE, FRANK J. See OHIO (Famous Ohioans).

LAUT, AGNES CHRISTINA (1871-1936), was a Canadian journalist and author. She became best known for her biographical and historical sketches. Her books include *Lords of the North* (1900), *Heralds of Empire* (1902), *Pathfinders of the West* (1904), *Vikings of the Pacific* (1909), and *Pilgrims of the Santa Fe* (1931).

Miss Laut was born in Stanley, Ont. She moved to Winnipeg when she was a child. After attending the University of Manitoba, she lived in the Rocky and Selkirk mountains. FREDERICK J. HOFFMAN

LAUTH, BERNARD. See IRON AND STEEL (Famous Men in Iron and Steel).

LAVA is molten rock that pours out of volcanoes or from cracks in the earth. It comes from deep in the earth where the heat is great. When lava first comes to the surface it is red hot, reaching temperatures from seven to ten times hotter than boiling water.

Properties of Lava. Lava is a solution of silicate minerals (see SILICA). It is similar to the hot liquid that would result if granite or basalt were melted. When lava cools quite rapidly, only a few crystals can form. The lava hardens into a rock that contains large amounts of natural glass.

The volcanoes or earth *fissures*, or cracks, that contain the lava are sometimes explosive. From time to time they blow out large quantities of dust and rock fragments that form layers between lava flows. Some types of lava contain large amounts of dissolved gases. As the gases expand, they are trapped in the lava, and form many bubbles. *Pumice* is a type of lava that contains many bubbles (see PUMICE).

Lands that were once covered with lava often become quite fertile after weathering has broken the lava into fine soil. Some lavas, such as a glassy lava called *perlite*, are heated in furnaces. They expand into a frothy material that is used to make a lightweight concrete.

Kinds of Lava. There are two kinds of lava. One kind is *viscous*, or sticky, and moves slowly like thick molasses.

Ace Williams

Hot Streams of Lava flow from the earth's interior during a volcanic eruption. When they cool, they form lava lakes.

Lava Often Forms Spongelike Rocks when it cools. These porous, cindery rocks from Mount Vesuvius are *volcanic scoria.*

L. Razsa, Black Star

The other kind is so fluid that when it first erupts it flows down the side of a volcano faster than a man can run. Both types of lava form a crust of rock.

Sometimes the liquid lava inside the crust cracks the hardened lava surface into many rough blocks that drag and tumble along as the lava creeps down the side of the volcano. At other times, the lava breaks a hole through the rocky crust and flows through, leaving a huge lava cave or tunnel. In Idaho, in the area of the Craters of the Moon, a person can walk into many lava caves that were formed only a few thousand years ago. The surface of such lava is covered with many wrinkles.

Location of Lava Beds. Many regions of the earth consist of piled-up sheets of lava. In the northwestern United States, the Columbia lava plateau is made up of a great lava pile several thousand feet thick in some places. The islands of Hawaii consist of a chain of volcanoes that are mostly built of lava. The mountain belt of southern Mexico, with its hundreds of volcanoes, also has a great lava pile. ERNEST E. WAHLSTROM

See also IGNEOUS ROCK; ROCK (Igneous Rock); VOLCANO.

LAVA BEDS NATIONAL MONUMENT is in northern California. Its 46,238.69 acres include unusual exhibits of volcanic action and lava flows. The monument, established in 1918, was the principal battleground of the Modoc Indian War of 1873.

LAVAL, *luh VAL,* **PIERRE** (1883-1945), was a French politician who collaborated with the Germans during World War II. After the Germans invaded France in May, 1940, Laval urged surrender. He held office in the Vichy government and succeeded Henri Pétain as premier of Vichy France in April, 1942 (see PÉTAIN, HENRI PHILIPPE; VICHY). After Germany surrendered in 1945, Laval was handed over to the new French government and was convicted of treason. He swallowed poison in a suicide attempt on the day of his execution, but was revived and shot by a firing squad.

United Press Int.

Pierre Laval

Laval was born in Auvergne province in southern France. He studied at the universities of Lyon and Paris. In 1914 he was elected to the French Chamber of Deputies, and after World War I began to rise in politics. He held several cabinet posts and was premier twice. In 1935, as premier, he shared in the Hoare-Laval Agreement, proposing that France and Britain make peace with Italy and Ethiopia at Ethiopia's expense. In 1938 he supported the Munich Agreement, giving Germany part of Czechoslovakia. E. J. KNAPTON

LAVAL, *luh VAL,* **UNIVERSITY** is a French-Canadian school in Quebec. It is conducted by the Roman Catholic Church. Courses are offered in the arts and sciences, agriculture, commerce, education, forestry and surveying, law, medicine, music, nursing, social sciences, pharmacy, philosophy, and theology.

Many other institutions are affiliated with the university. Laval received a royal charter in 1852. For enrollment, see CANADA (Education [table]). ANDRÉ PATRY

LAVATER, JOHANN KASPAR. See Physiognomy.

LAVENDER is a small bush that bears fragrant flowers and leaves. It belongs to the mint family. It grows wild in Mediterranean countries, and occasionally is cultivated.

The lavender bush grows between 3 and 4 feet high. It has long, narrow, pale green leaves and pale purple flowers. The flowers have given the name *lavender* to this shade of purple. The flowers grow in whorls around a single stalk. When dried, they keep their fragrance for a long time.

Lavender comes from the Latin word *lavo*, meaning *to wash*. This name was used because the Romans put the leaves and flowers in the water when they bathed. In tradition, lavender represents purity. Ladies once stored their linens and clothing with dried lavender and leaves. The expression "lavender and old lace" is often used to mean someone with gentle manners. Today the plant is used to make perfume.

J. Horace McFarland

The Long Slender Leaves of the lavender grow on the same single stalk from which the fragrant flowers extend.

Scientific Classification. Lavender belongs to the family *Labiatae*. The plant is classified as genus *Lavandula*, species *vera*. George A. Beach

See also Mint; Perfume.

LAVENDER PIT, one of the world's largest open-pit copper mines, is located at Bisbee, Ariz. It is owned by the Phelps Dodge Corporation. The mine is named after Harrison M. Lavender, a company officer who carried out the plan to produce valuable copper ore from low-grade copper-bearing rock. Production of the ore began in 1954. The mine produces about 12,000 tons of ore a day. Alice B. Good

LAVERAN, *LAH VRAHN*, **CHARLES LOUIS ALPHONSE** (1845-1922), a French Army surgeon, discovered the parasite that causes malaria. He also made other contributions to the knowledge of tropical diseases. He received the 1907 Nobel prize in medicine.

In Algeria, in 1880, Laveran recognized the malaria parasite in the blood of soldiers suffering from the disease. As early as 1884, he became convinced that mosquitoes played an important part in spreading the disease. In 1892, he described several species of *trypanosomes*, the parasites that cause sleeping sickness.

Laveran was born in Paris and served as a military physician for 29 years. He retired from the army in 1907 and became director of the Honorary Service of the Pasteur Institute in Paris. Henry J. L. Marriott

LA VÉRENDRYE, SIEUR DE. See Manitoba (Famous Manitobans); Wyoming (Exploration and Settlement).

LA VERNE COLLEGE is a coeducational school in La Verne, Calif. The college operates under the auspices of the Church of the Brethren. La Verne offers liberal arts and teacher preparatory courses, and grants B.A. degrees. It was founded in 1891. For enrollment, see Universities and Colleges (table).

LA VILLITA. See Texas (Interesting Places).

LAVINIA. See Aeneid.

Bettmann Archive

The French Chemist Lavoisier and His Wife were painted by the famous French artist, Jacques Louis David.

LAVOISIER, *LAH VWAH ZYAY*, **ANTOINE LAURENT** (1743-1794), was a French chemist. By a series of careful experiments, he proved in 1774 that burning is the result of the rapid union of the burning material with oxygen. This was the first accurate, scientific explanation of the mystery of fire.

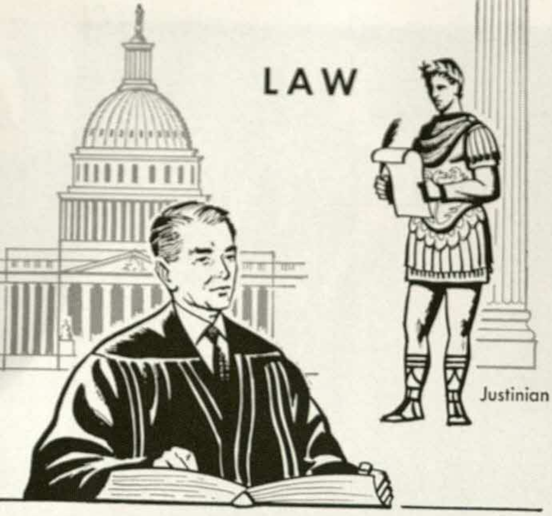
Lavoisier also proved the law of conservation of matter. This law states that matter can be neither created nor destroyed, but can only be changed from one form into another. When a candle burns, it appears to have been destroyed. Lavoisier showed that there is as much mass or weight present after the candle burns as before. The substances have only changed their forms. He applied his ideas to combustion in the body, and showed that the source of energy is the slow burning of food.

These ideas led him to write the first chemical equation. In such an equation, the mass of materials before any chemical change must equal the mass of products after it. Lavoisier and other French chemists worked out the present-day system of chemical names. He wrote *Elements of Chemistry* (1789), the first modern textbook of chemistry.

Lavoisier was born in Paris of well-to-do parents, and attended the Collège Mazarin. He became especially interested in physical sciences and mathematics while in school. In 1766, the French Academy of Sciences awarded him a gold medal for a plan of lighting city streets. Two years later he became a member of the academy. He established agricultural experiment stations and tried to improve farming methods in France. For most of his life, Lavoisier was a member of the financial company that collected taxes for the government. The leaders of the French Revolution regarded this group as aristocrats in the employment of the government. Lavoisier and the other members of the financial company were put to death on the guillotine by the revolutionists. Henry M. Leicester

See also Oxygen; Priestley, Joseph.

LAW



LAW. Wherever men have lived together, they have found it necessary to develop rules of conduct. They need rules for the settlement of disputes. They also need rules for the organization of their governments. *Law* is the set of rules which the government enforces through its police, its courts, and its other agencies.

Law makes it possible for men to live together peaceably in a community. If there were no law, every man could do just as he pleased. With law, the people in a community know that the government will enforce rules that will make it possible for them to live together without conflict. The philosophy or science of law is called *jurisprudence*.

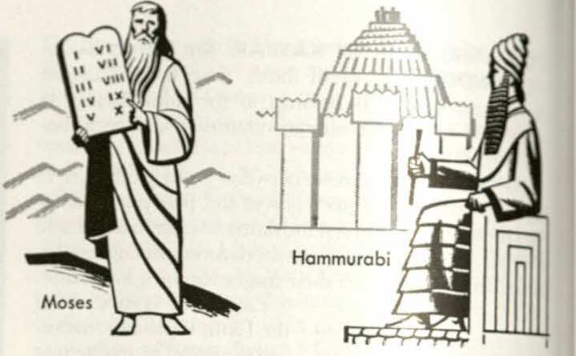
Kinds of Law

Public Law is the body of rules in which the government is directly involved. Public law regulates the relationships between individuals and the government. One group of rules in public law defines and limits the powers of the government.

The part of public law most familiar to many persons is *criminal law*, which is the body of rules that we are commanded to obey. The government may fine those who do not obey, or even put them in jail. See CRIME.

A number of smaller groups of rules also come under the general heading of public law. *International law* is concerned with agreements among nations, problems of boundaries, and other questions arising from the relationships of one country with another (see INTERNATIONAL LAW). *Constitutional law* deals with the problems that have arisen about various clauses in the United States Constitution. Problems in constitutional law include the organization of the government and the guarantees of our liberties. *Administrative law* is the body of rules made by administrative or executive agencies of government. The Interstate Commerce Commission is such an agency. See the sections later in this article dealing with *The Constitution* and *Administrative Rulings*.

Private Law, or **Civil Law,** includes the rules that regulate the relationships among people. Private law includes many smaller groups of rules. Some examples are the rules relating to contracts, personal injuries, and real estate.



Laws Have Developed gradually from the time of Hammurabi, a ruler of the Sumerians, more than 3,800 years ago.

Many persons think only of criminal law when they hear the word *law*. However, most lawyers and courts spend most of their time dealing with problems of private law. These private law problems include taxation, business affairs, the transfer of property, and the collection of money for persons injured through the fault of others. Cases or proceedings in civil courts are often called *lawsuits*.

Sources of Law

Where do we find the rules which are enforced by the government? They are found in customs, in constitutions, in legislation by lawmaking bodies, in the decisions of judges, in the orders of administrative agencies, and, in some countries, in decrees made by dictators.

The Constitution. Many of the basic rules of a country or state are contained in its constitution. The rules in the constitution have force above all other rules of law in the country. To ensure that these basic rules remain in force, it is usually necessary to obtain the agreement of most of the people in order to change a constitution. The United States Constitution was written by a constitutional convention. In Canada, the constitution is a statute enacted by the Parliament of Great Britain. It is called the British North America Act.

Statutes. Many rules are made by persons elected to do the job of lawmaking. These men are called *legislators*. A rule that has been enacted by a lawmaking body is called a *statute* or *statutory law* (see UNITED STATES, GOVERNMENT OF [How a Bill Becomes a Law]). The legislators of the United States are the Senators and Representatives elected to the Congress. Each state also has its own elected legislators. In Canada, the legislature is called the Parliament. Each province has its own provincial parliament.

Common Law is another important source of rules in English-speaking countries. These common-law rules are made by judges, who enforce the customs of the community as each understands them. When a court has decided on a rule that it considers just, and that agrees with the customs and opinions of the community, that court and the other courts enforce the rule established in this first case. The case that first sets down a rule of this kind is called a *precedent*. After some time, when a rule has been uniformly applied in a number of cases, it becomes a solid part of common law. It is not rejected until a court feels that the rule no longer reflects the beliefs of the community. When a court rejects a precedent, it is said to *overrule* the earlier judgment.

Even though a rule is written in the form of a statute,

In a Court of Law, two lawyers discuss a point in a case which has been brought to trial. The judge will decide the argument when they finish. The clerk keeps a record of every word spoken in the trial.

Keystone

difficult problems often arise in deciding exactly what the statute means, or to whom it applies. Such questions are decided by the courts in accordance with common-law traditions, after careful study of the statute. When a court has decided what the statute means, other courts follow its decisions, just as they follow common-law rulings.

Administrative Rulings are made by bureaus of the government called *administrative agencies*. An example of such an agency is a local board of health, which regulates such things as standards of cleanliness in restaurants and the purity of drinking water. The Interstate Commerce Commission is a federal agency that regulates the rates charged by railroads. The rules that these agencies make, and the rules under which they operate, have become an important branch of law.

Decrees. In countries where the government has absolute power, such as dictatorships or absolute monarchies, laws are made without the consent of the people. A law may simply be announced by the dictator as a *decree*. The people do not agree with the law, but they have no way of changing it.

How Laws Change

In a Democracy, the people have the power to determine the rules under which they live. The rules laid down by legislatures, as well as common-law rules, are constantly being changed to reflect changes in the customs and desires of the people. But sometimes the law fails to keep up with the changing society. Some very strange rules remain technically in force, although no one bothers to conform to them. For example, an ancient law about trial by battle was in force in England until 1827, although it had not been enforced for more than three hundred years.

On rare occasions, the government may enforce a rule that is no longer accepted by most of the people. For example, in the early 1900's, many courts in the United States followed an old ruling which said that they could not enforce newer regulations on the number of hours that children could work. Many people were dissatisfied with the old rule, and thought that the courts should enforce child-labor rules. Finally, the pressure of public opinion caused the courts to abandon the old rule and to enforce new rules which limited child labor.

Sometimes courts or legislatures have established a rule with which most of the people have disagreed. When this happens, and when the rule concerns something important, some of the legislators who passed the law may be defeated in elections. Other men will be elected who promise to change the rule. Or the rule simply may not be enforced. Sometimes the rule is one that concerns only a small number of people, such as a requirement that banks make a certain kind of report to a public official. Even then, if most of the people affected by the rule believe that it is out of date or impractical, the legislators and the courts will usually respond by changing the rule.

In a Dictatorship, the people have no peaceful way to bring pressure on the government to change the law. The dictator can use decrees, or he may have his laws approved by a legislative body that always does what he wants. If he wants his decree to look as though it has popular support, he may require all the citizens to "vote" on it. In such a so-called "election" the voters usually do not have secret ballots, and the result always follows the dictator's wishes. The only way the people can change the law under a dictatorship is by overthrowing the government by revolution.

History

Even before men could write, the laws and customs of each community were passed down from one generation to the next by the older members of the group. Later, some of the laws were written down, for the sake of clarity and permanence.

The Code of Hammurabi. The earliest law which has been preserved is the one developed in the 1900's B.C. by Hammurabi, a ruler of the ancient Sumerians. The Sumerians lived in the valleys of the Tigris and Euphrates rivers. Hammurabi's code set forth a complete system of law. It set down the kinds of punishment to be used for a variety of offenses. It also established the amounts of payment to be made for various services. The code continued to be used in that part of the world long after Hammurabi's death.

The Law of Moses. About 1200 B.C. Moses, a Hebrew, gave to the world the Ten Commandments. The Ten Commandments stated principles of behavior that had long been recognized as good. These Commandments,

United Press Int.

A Monument to the Magna Carta stands at Runnymede near London, England, where King John granted the famous document in 1215. Dedicated by the American Bar Association, it honors the Magna Carta as the first step toward present-day law and liberty.

in one form or another, can be found stated in law everywhere during all ages of history.

The Law of the Ancient Greeks. The Greeks were among the first to introduce the idea that laws are made by men and can therefore be changed by men whenever the need arises. This idea marked a great step forward in human thought. Before that time, people believed that laws always came from a god or group of gods. They thought that these divine laws were revealed through the rulers or priests and could not be changed by men, even though the laws were unjust.

The Greeks respected law more than any other people had done before. They believed that a country should be ruled by law rather than by men. This does not mean that men were not in governing positions. It means that the power of governing officials was carefully limited by law. All government activities were regulated by law. The Greeks had well-defined laws relating to property and inheritance, to contracts, and to matters relating to trade. In Athens, juries of citizens or citizens sixty years of age who were called *arbitrators* tried legal cases. These men were not always well informed on the fine points of the law, but the Greeks believed the spirit of the law to be much more important than its wording.

The proposals made by Solon, who lived about six hundred years before Christ, were a great step in the development of Greek law. Solon persuaded the Athenian nobles to treat all citizens alike in matters of justice and voting in the assembly. One of the famous works on Greek law is Plato's *The Laws*.

Law in Ancient Rome. The Romans developed law much beyond the Greeks. Roman law was more complete, and it was in Rome that the first legal profession developed. The first important step in Roman law came in 450 B.C., when the Law of the Twelve Tables was drawn up by a council of ten men. These Tables were based on the Roman religion. They set forth customary ways of behavior. The laws were incribed on brass tablets. For hundreds of years, many Romans memorized the Twelve Tables, even though they had no other schooling.

In Rome the ministers of justice were called *praetors*. Their duties were in some ways like those of modern judges. The praetors were responsible for administering the Law of the Twelve Tables. In cases not covered by the Tables or by any other statute, the praetors had the power to make decisions that had the effect of law.

After the Roman Republic gave way to the Empire, Roman Emperors made law by decree. But, on the death of each emperor, the senate had the authority to decide whether or not the decrees of the dead ruler should remain in force.

The Law of the Twelve Tables applied only to Roman citizens. The Romans were forced to develop another system of law which would apply to all the conquered peoples within their empire. They tried to develop a system of laws based on the moral instincts of man, which would be common to all civilized men wherever they might be. This system of law was called the *jus gentium*, or *law of nations*. It was based on what the Romans thought was best in the law of all civilized countries.

A great step in the development of law was the *codification*, or classification, of Roman laws by the emperor Justinian. For a long time, jurists had been working to bring all Roman laws together and to present them to the world in a unified and organized group. This compilation of Roman law was completed in Justinian's *Digest* and *Code*. These works had a great influence on later European laws.

Law in Medieval Europe. The influence of Roman law declined after the fall of the Roman Empire. In much of Europe, law developed by the Church, often called *canon law*, took the place of Roman law. But the Roman law was preserved, and finally its influence increased again. As European law developed during the late Middle Ages, it borrowed from both the language and the ideas of Roman law. The first law school was founded at Bologna, in northern Italy, in the 1200's. Its courses consisted of lectures on the Roman laws.

Famous University Law Schools

University of Michigan's Legal Research Building stands on the campus at Ann Arbor.

Harvard Law School's Langdell Hall, at Cambridge, Mass., contains a huge library.

Harvard News Office; Eck Photo, Ann Arbor; United Press Int.; Northwestern University

Northwestern University's cloister and garden are part of the downtown campus in Chicago.

Yale University's Sterling Law Quadrangle, at New Haven, Conn., was completed in 1931.

Modern European Law. The ideas of Roman and canon law that were worked out in the Middle Ages have continued to the present day in Europe. European law was also greatly influenced by the *Code Napoléon.* This was a simple and uniform system of law written by legal experts brought together by Napoleon. The French emperor forced most of Europe to accept his system of laws during his conquests. Napoleon's empire did not last long, but his legal code had great merit. It has had continuing importance in France, Germany, Italy, Spain, and other European countries.

The term *civil law* is sometimes used to refer to the laws of European countries other than Great Britain. The term *common law* is sometimes used to describe the laws of English-speaking countries. When these terms are used in this way, civil law and common law are meant to include all the laws, both public and private.

American Law. When English colonists settled in North America, they brought with them the English common law. Common law is the basis on which both American and Canadian law have grown. Lawyers had to learn the common law by reading what judges had said in deciding various cases. The desire to have the law written down became strong in the 1800's, and today the unwritten common law is often supplemented by comprehensive statutes called *codes.*

English common law is the basis of most of the law in the United States and Canada, but a few states where the early settlers were Spanish, such as California and Texas, still have traces of Spanish law. Louisiana still retains much of the Code Napoléon, which was in force when the state was a possession of France. Similarly, the law of Quebec is largely based on French civil law.

But many of the rules of law which reflected the customs of Spain, France, and England were found to be impractical in this country. Often the older laws were changed somewhat to suit the special needs of the new country. For instance, the common law of England required each man to fence in his cattle. The owner had to pay for any damage the cattle caused if he did not fence them in. This law was practical in England, where land holdings were usually rather small. But, in the western part of America, farms and ranches were larger, men raised more cattle, and wood for fences was hard to obtain. It was more practical for men to fence in their crops and gardens than to fence in the cattle. The courts therefore enforced a rule requiring each man to fence in his crops. If he had not fenced his crops, and they were damaged, he could not collect damages. This rule was more in keeping with American customs. It is an example of how the common law is constantly being changed to meet new conditions.

How Lawyers Are Trained

For hundreds of years, persons who wanted to study law had to work privately with lawyers who taught in their spare time. In England, these students lived in the Inns of Court in London (see INNS OF COURT). Gradually, this private legal training gave way to courses given at the larger universities and colleges.

Law Schools. The United States today has more than 160 law schools, with some 38,000 students enrolled every year. It usually takes a student three years to go through law school. An ever-increasing number of law schools admit only college graduates. Most other law schools require students to have completed three years of college study. After completing his course of study, the student is granted the degree of Bachelor of Laws (LL.B.). Some law schools grant the degree of Juris Doctor (J.D.), or Doctor of Law, to graduates who had a prior undergraduate degree and maintained a certain academic average. Most of the law schools are connected with universities. A lawyer must pass a bar examination. He is admitted to the bar when he is licensed to practice before the courts of his state or province.

The first law school in the United States operated in Litchfield, Conn., from 1784 to 1833. It was founded after earlier attempts to establish lectures on law at various colleges had failed. Harvard Law School was founded in 1817. Several other university law schools, including those at Yale, Pennsylvania, Michigan, and Northwestern, were founded between 1830 and 1860.

The *case system* of instruction was established at Harvard in 1870. In this system, students analyze individual legal decisions instead of studying textbooks. It is now used in all leading law schools.

In Canada, each large university has a faculty of law. Roman law and French civil law are given greater emphasis than in the United States.

Careers in Law. The study of law opens the door to many careers. Young persons who think of entering the legal profession often have the idea that a lawyer is a person who tries cases before a court. They picture themselves as skillfully questioning witnesses, or holding juries spellbound with their eloquence. But the average lawyer spends very little time in court. Even a trial lawyer does most of his work in his office. Weeks or months of study may go into the preparation of a trial case which will last only a day or two in the courtroom.

Most lawyers spend a great deal of time in giving advice on legal matters. They draw up contracts, wills, and other legal papers. They serve as executors or trustees. They try to settle disputes without lawsuits. Many persons agree that the ablest attorney is one who can protect his client's interests without going to court.

Practicing lawyers may specialize in many different fields, such as criminal law, corporation law, or patent law. Railroads, insurance companies, banks, and large business concerns usually employ full-time lawyers to handle their legal affairs. The heads of many large businesses are men who have been trained in law.

The law is one of the commonest roads to public office. Congress, the state legislatures, and the administrative branches of government draw more people from the law than from any other profession. Most judges have been lawyers, and there are some public offices, such as that of prosecutor, or district attorney, which must be held by lawyers. About two of every three presidents of the United States were lawyers prior to being elected President.

ERWIN N. GRISWOLD

Related Articles. See the LAW section of the READING AND STUDY GUIDE for detailed study outlines listing the articles in WORLD BOOK relating to law. See the Government section of the various state, province, and country articles, such as ALABAMA (Government). See also the following articles:

BIOGRAPHIES

Alphabetical lists of biographies relating to Law appear under the headings Lawyers and Jurists; Chief Justices, in the BIOGRAPHY section of the READING AND STUDY GUIDE. See also the following great lawmakers:

Hammurabi
Justinian I
Moses
Plato
Solon

UNCLASSIFIED

American Bar Association
Barratry
Business Law
Canon Law
Civil Law
Code Napoléon
Common Law
Court
Crime
Due Process of Law
Equity
International Law
Jury and Trial by Jury
Justice, Department of
Justinian Code
Law Enforcement
Lawyer
Legislature
Maritime Law
Martial Law
Ordinance
Parliamentary Law
Public Opinion
Suit
Sumptuary Law
Twelve Tables, Laws of the
United States Constitution

Outline

- **I. Kinds of Law**
  - A. Public Law
  - B. Private Law
- **II. Sources of Law**
  - A. The Constitution
  - B. Statutes
  - C. Common Law
  - D. Administrative Rulings
  - E. Decrees
- **III. How Laws Change**
  - A. In a Democracy
  - B. In a Dictatorship
- **IV. History**
- **V. How Lawyers Are Trained**
  - A. Law Schools
  - B. Careers in Law

Questions

What new idea about law did the Greeks introduce?

What American state still uses some laws worked out by Napoleon?

What is the earliest law preserved today? About how old is it?

Why were the Twelve Tables important?

What are statutes? How are they generally passed?

Why are laws constantly changing? What may happen if laws are not changed from time to time?

What are some duties a lawyer may perform in his daily work? In what fields may he specialize?

In what kind of government is law by decree common?

LAW, ANDREW BONAR (1858-1923), a British statesman, served as prime minister from 1922 to 1923. He entered Parliament in 1900, and became leader of the Conservative party in 1911. In December, 1916, he refused the King's offer to try to form a new cabinet, and served under Prime Minister David Lloyd George, as Chancellor of the Exchequer. In 1922, Law and other Conservatives forced Lloyd George's resignation. Law was born in New Brunswick, Canada, but moved to Scotland when he was 12. Alfred F. Havighurst

LAW, DUE PROCESS OF. See Due Process of Law.

LAW, JOHN (1671-1729), a Scottish financier and gambler, tried to revive the French economy by opening a bank in 1716 to issue paper money. His plans also included land speculation and trade in Louisiana, which became famous as "The Mississippi Scheme."

Law was born in Edinburgh. As a boy, he showed remarkable skill in mathematics. He went to London when he was 20. In 1694 he killed a man in a duel, and was arrested and sentenced to death. He escaped from prison and fled to Amsterdam, where he studied the operations of the Bank of Amsterdam. He then traveled throughout Europe and accumulated a large fortune through amazingly successful gambling.

Louis XIV of France died in 1715, leaving the economy of the country in virtual ruin. Law immediately went to France, and opened his General Bank in 1716. The paper money issued by the bank soon became readily acceptable, and the bank at first helped business. In 1717, Law established the Company of the West, later called the Company of the Indies. This company soon acquired a monopoly on trade with nearly all the French possessions. In 1718, the bank became the Royal Bank, with Law as director. By this time he was one of the most powerful men in France.

Law's bank issued excessive quantities of paper money. Much of it was used to speculate in stock issued by the Company of the Indies. Before long, some speculators demanded gold for their paper money. The whole project collapsed with great losses. Thousands of persons were left bankrupt in the panic that followed (see Mississippi Scheme).

Law's life was threatened frequently, and he fled from France in December, 1720. He spent the rest of his life gambling throughout Europe. John B. McFerrin

LAW ENFORCEMENT is one of the most important ways a government has of protecting its citizens. It usually refers to the action of police and the courts in catching and punishing criminals. But a broad use of the term also includes the administration of justice in all law cases by the courts. Law enforcement is necessary to maintain order in a community, state, or country.

Private citizens have more to do with law enforcement than simply obeying the laws. They should report to the authorities whenever they see a law being broken. Every citizen has the right to arrest a person he sees committing a crime (see Arrest).

Criminal Law Enforcement. Police agencies and courts enforce the criminal laws of a community. The police protect the safety and property of citizens, and arrest persons who break the laws.

Local traffic commissions and crime-prevention bureaus also enforce laws in their communities. Many local governments use inspectors to enforce laws dealing with licenses, fire prevention, building safety, and the use of honest weights and measures.

The most important criminal law enforcement body in the federal government is the Department of Justice. The Federal Bureau of Investigation (FBI) makes investigations for the Department of Justice. Many other federal agencies also enforce laws. They include the Interstate Commerce Commission, the Federal Trade Commission, the Coast Guard, and the Secret Service.

Civil Law Enforcement. If a person injures you, how can you make him pay for the damage he has caused? First, you may go to a lawyer, who will threaten the man with a lawsuit. If the person will not pay, the lawyer will help you sue him, and the court may order him to pay you. If he still refuses, you have the right to ask an officer of the court to take enough of the man's money or property to satisfy your claim. The court may put him in jail if he refuses to give up either sufficient money or property to satisfy the claim.

World Law Enforcement. Efforts to establish world law through the League of Nations after World War I had little success. The League had no effective way to enforce its laws. After World War II, the United Nations set up another organization of nations to enforce world peace. The Security Council of the United Nations was made responsible for maintaining the peace. After negotiation or arbitration has failed, the Security Council is empowered to use military force against any nation that threatens world peace. Members of the United Nations are expected to obey the decisions of the International Court of Justice. If a nation refuses to follow the decisions of the International Court of Justice, the Security Council of the United Nations may take any action, including armed intervention, that it deems necessary in order to maintain peace throughout the world. Erwin N. Griswold

Related Articles. See Police with its list of Related Articles. See also the following articles:

Court
Crime
Federal Bureau of Investigation
International Law
Justice, Department of
Protection
United Nations (Achievements and Problems)

LAW OF THE LAND. See Due Process of Law.

LAWLESS, THEODORE KENNETH (1892-), an American Negro physician, became known for his work in the field of *dermatology*, or the study of skin diseases. He helped develop cures for several rare and baffling skin diseases. He also worked actively for many civic organizations. Lawless won the 1954 Spingarn medal. He was born in Thibodaux, La., and received his medical degree from Northwestern University. He taught dermatology at Northwestern from 1924 to 1941, and also did research there. Noah D. Fabricant

LAWMAKING. See Legislature; United States, Government of (How a Bill Becomes Law).

LAWN is a thin, rather stiff cotton or linen cloth. It is of plain weave and varies greatly in thickness. It ranges from very thin, or *sheer*, to the thickness of cloth found in most handkerchiefs. A standard cotton lawn is called *India linon.* Fine linen lawn is called *handkerchief linen.* Lawn is used for handkerchiefs, neckwear, lingerie, blouses, infants' wear, and curtains. See also Bleaching; Linen. Grace G. Denny

Toro Mfg. Corp.

Walking or Riding, the operator finds it easy going with a motor-driven lawn mower. The smaller mower, *above*, cuts an 18-inch-wide strip. The big mower, for tougher and larger jobs, cuts a 76-inch swath.

LAWN is an area or plot of ground that is well covered with a thick seeding of grasses. Lawns usually surround buildings in which people live, and often form part of the landscaping around public buildings. They also provide recreation areas in parks and playgrounds.

Planting a Lawn

A good lawn must be smooth, but not necessarily level. The land should have a minimum of terracing, be well drained, and planted with the kind of grass suitable to the climate. The plants should provide a thick uniform covering, and should be uniform in color and texture and vigorous in growth.

Preparing the Soil. The soil to be planted with grass should first be graded and smoothed, and all debris removed. Special attention must be given to the preservation of all *topsoil*. It is kept as a covering for all *subsoil* exposed in the grading and smoothing.

The subsoil layer should be worked to a depth of three to six inches before the topsoil is replaced. If a soil test shows that the subsoil lacks lime, it should be added before the subsoil is worked. If the soil needs fertilizer, two to three pounds of superphosphate should be added to each 100 square feet of the lawn.

After the subsoil is properly conditioned, the topsoil should be replaced, because it is very difficult to establish a good lawn without a layer of topsoil. Before the final grading, several things should be added to the soil. They include lime; organic fertilizers such as manure, compost, or peat moss; and a commercial fertilizer at the rate of two to four pounds for each 100 square feet of lawn. The lime and fertilizers should be thoroughly worked into the topsoil by harrowing or disking, and rolling if the area is large; or by hand raking and rolling if it is small. A smooth, compact surface is necessary to insure the satisfactory establishment of a lawn.

Planting the Grass. The *sodding* method is the most expensive way to establish a lawn. It is used mostly on small areas where an immediate establishment of cover is important, or on slopes where erosion may be heavy. In sodding, sections of soil already covered with grass are cut, transported to a new area, and laid in much the same manner as floor tiling is laid.

Sprigging is the use of small plugs or cuttings. It is used where the grass being planted is a poor-seeding or nonseeding species, therefore making commercial seed unavailable. Sprigs are planted at intervals which depend upon the variety of grass. These range from three to five inches in rows 18 inches apart to spacings as wide as two to three feet apart in each direction. Grasses germinated by this method usually cover the entire area by the rapid growth of low-lying stems.

Seeding is the most common, most successful, and cheapest method of establishing a lawn wherever commercial seed is available. Hand seeding is practical except on large areas. The seed to be sown should be divided into two lots. The seed from one lot is sown walking in one direction, and the seed from the other is sown walking at right angles to the first. The sown seed should be covered lightly by raking, care being taken not to bunch the seed in the process. Rolling helps insure contact of seeds and soil, thus encouraging quick germination and a smooth surface. The soil should receive light, frequent waterings. *Mulching* with a light

HOW TO PREPARE AND CARE FOR LAWNS

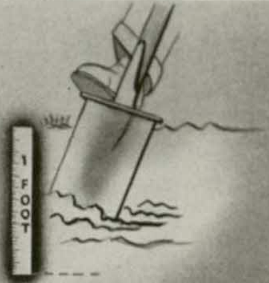
Kentucky Bluegrass grows best in a fertile soil where the weather is cool and moist. Because the tops of the grass have a tendency to wilt during the summer, close cutting is recommended. Bluegrass is hardy and attractive when it is properly cared for, and stays green during early spring and late autumn.

Bent Grass is one of the most common types of lawn grass. Creeping bent develops long runners which have many joints, or nodes. The plant takes root wherever the nodes touch the ground. This makes a very tight growth of grass that crowds out everything else, including the undesirable weeds.

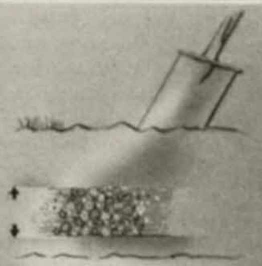
Fescue Grass is one of the hardiest of the lawn grasses. It has fine blades and a spreading root system that makes it valuable where the soil is poor or sandy, and in shaded places. The tops are stringy and tough and resist heat well. Creeping red fescue is used in very densely shaded spots.

PLANTING

Late Summer and Early Autumn is the best time to seed a lawn. The grass spreads best and throws out the most shoots at this time.



To Prepare a New Lawn the soil should be spaded about a foot deep. The top inch should be well pulverized.

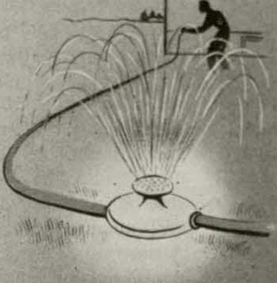


Hard Soils like clay should be loosened by mixing cinders or coarse sand into them to provide drainage and air.

A Well-Balanced Fertilizer should be spread over the soil and worked in as the ground is spaded.

CARE

Start Cutting the Grass when it is about 3 to 4 inches tall. From then on keep it mowed to about 2 inches. Leave short clippings on the lawn.



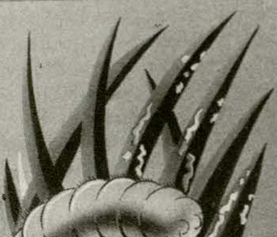
Watering should be sufficient to wet the ground several inches below the surface, if it is to be effective.

Plant Food should be added to the lawn each year just after the frost leaves the ground in early spring.

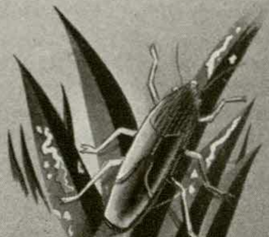
Grass in Shady Places must be watered and fertilized more than that in sunny spots.

ENEMIES

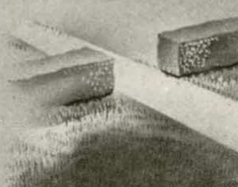
Control of Weeds has been simplified by use of chemicals such as 2-4D which kills the pests but not the grass. Digging is effective but more work.



Grubworms often attack lawns. They may be controlled by spraying the grass with an arsenate-of-lead solution.



Chinch Bugs can be controlled by applying tobacco dust, or any of the standard nicotine solutions in a spray.



Fungus Diseases, such as brown patch and dollar spot, are stopped with prepared insecticides sold at stores.

layer of straw will conserve moisture, prevent erosion, and protect the seedlings from drying out (see MULCH).

Kinds of Lawn Grasses

The kind or kinds of grasses to be used in a lawn depend on the environment in which the lawn is to be established. Grasses adapted to the cooler, more humid areas include the *bluegrasses, fescues,* and *bent grasses.* White clover is often used with these grasses for lawns in the northeastern, north-central, and northwestern parts of the United States. Commercial lawn seed mixtures for these areas always contain a percentage of *rye grass* seed. The rye grass grows fast, producing a quick cover. But it also is short lived, so it soon disappears, leaving room for permanent grass.

Kentucky bluegrass ranks as the most widely grown grass for lawns. With fertile soil and good drainage, it is a dark green, long-lived, sod-forming grass. It needs a good deal of sun for best results. Bent grasses are fairly tolerant of acidic soil and poor drainage, and will withstand closer clipping than most lawn grasses.

Grasses most commonly used for lawns in warmer, more humid regions include *Bermuda, St. Augustine, Zoysia,* and to a lesser extent *carpet* grass and *centipede. Grama* grasses and *buffalo* grass serve as a cover in drier regions. St. Augustine, Zoysia, and centipede grasses must be propagated by stolons or sprigs, and Bermuda and carpet grass are readily propagated by this method. Seeding best propagates all other lawn grasses.

Caring for Lawns

Trimming. The bents, Zoysias, Bermuda, St. Augustine, and carpet grasses will tolerate close clipping at a height of one inch or less. Most other grasses do better if clipped at a height of 1½ to 2 inches, or higher.

Watering. It is far better to water thoroughly at infrequent intervals than to sprinkle daily. Weeds and weedy grasses may be stimulated much more by frequent waterings than the grass the grower desires.

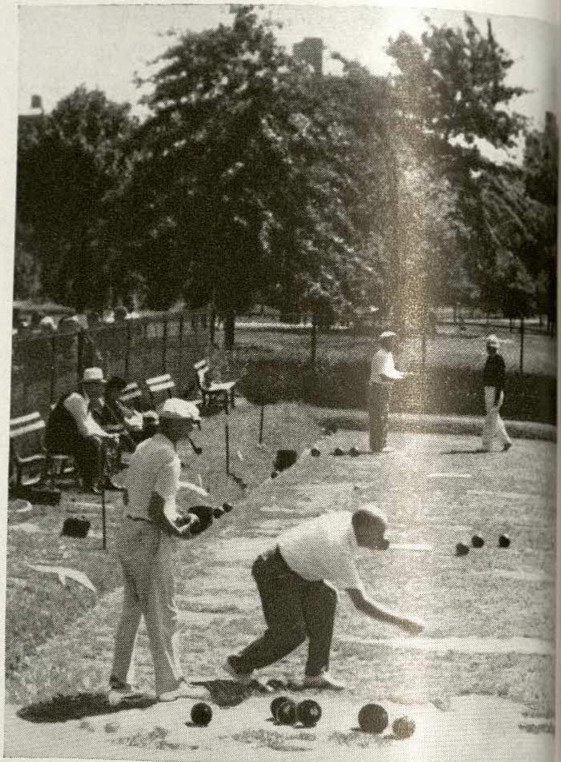
Fertilizing is a necessity for a good lawn. An application of a commercial fertilizer in the early spring and again in the early fall at a rate of 15 to 25 pounds for 1,000 square feet of lawn may be considered as a standard. Care should be exercised to insure uniform distribution. If lime is needed, it may be applied at any time in the form of ground limestone.

Weeds, Insects, and Diseases. The best way for lawn grasses to compete successfully against weeds is to make the conditions as ideal as possible for the grasses. Regardless of effort, plantains, dandelions, ragweed, and other broadleaved weeds often invade a lawn. They can be controlled by spraying with 2,4-D according to the manufacturer's directions. Lead arsenate is fairly effective against chickweed and some annual grasses.

Troublesome insects include grubs, army worms, cutworms, ants, and mole crickets. If they are present in destructive numbers, they may be controlled by applications of DDT or some chlordane products.

Diseases that most frequently occur in lawns are *brown spot* and *dollar spot,* under conditions of high temperature and humidity. They are fungus diseases, and may be treated by commercial drugs. ROY G. WIGGANS

See also GRASS; LANDSCAPE GARDENING; SOIL.



LAWN BOWLING is played on a smooth, level, grass plot called a *green.* It resembles horseshoes and other games in which the object is to get close to a target.

How to Play. A bowling green is about 120 feet square. A shallow *ditch* bordered by *banks* about 9 inches high surrounds the green. The green itself is divided into six *rinks,* each 120 feet long and 20 feet wide.

The object of a team is to roll its *bowls,* or balls, as near as possible to the *jack,* a white earthenware ball 2½ inches in diameter. The wooden bowling balls measure 5 inches in diameter and weigh no more than 3½ pounds. They are made with a *bias,* which means that one side of the bowl is larger than the other. A bowl will curve as it rolls unless delivered with great speed. A slow rolling bowl may curve as much as six feet from a straight line on a good rink.

The first player, called the *lead,* stands with one foot on a rubber mat. He starts the game by rolling the jack 25 yards or more down the rink. He then delivers his first bowl as directed by his *skip,* or captain. Then the first man on the other team bowls. Each player takes his turn. The skips bowl last. A player's object is to place his bowl as close to the jack as possible, or to knock an opponent's bowl away from the jack, or to guard a previously thrown bowl of his team. Each player rolls two bowls in a team match. He rolls four bowls in a singles match. The side with the bowl resting nearest the jack scores one point. A point is also given for each bowl nearer the jack than the nearest of the opponent's bowls. The match may be decided by a predetermined number of points (usually 21), or *ends* (innings).

History. The origin of the game can be traced to ancient Egypt. Lawn bowling was played in England by the 1100's, and called *bowles.* Later, it was called

Charles Phelps Cushing

Lawn Bowling makes a pleasant pastime on a sunny afternoon in New York City's Central Park. The game, brought to the U.S. from Great Britain, was a popular sport among the colonists.

lawn bowling to distinguish it from tenpins (see Bowling). The game reached the American colonies about 1690. It flourished along the East Coast until the Revolutionary War, and was revived about a hundred years later. By 1915, lawn bowling had become so popular that the American Lawn Bowling Association was formed in Buffalo, N.Y. National and divisional championships take place in the U.S. every year.

Lawn bowling is more widely played in Canada than in the United States. Canada has about 400 clubs. The Canadian Lawn Bowling Council coordinates the activities of the provincial associations. Australia has about a thousand clubs. Several hundred thousand bowlers play in Great Britain. Walter H. Gregg

LAWN TENNIS. See Tennis.

LAWRENCE, Mass. (pop. 70,933; alt. 65 ft.), is an industrial city located on the banks of the Merrimack River about 26 miles north of Boston. For location, see Massachusetts (color map).

Boston financiers, headed by Abbott Lawrence, provided the money to harness the falls of the river at the present site of Lawrence in 1845. They built a stone dam, lined the banks of the power canal with textile mills, and erected rows of workers' homes. Lawrence was incorporated as a town in 1847 and as a city in 1853. Immigrants poured into the city from other countries to work in the mills. In 1912, the workers went out on a strike that attracted nationwide attention. Over 20,000 persons joined in a picket line. The strike led to improved conditions throughout the textile industry.

Lawrence was a one-industry community until the 1920's, when a number of mills went out of business or moved away. The closing of the mills brought economic hardships, but the city worked successfully to diversify. Today, its leading products, in addition to the traditional cotton, woolen, and worsted goods, are boxes, carpets, cloth and leather jackets, coated papers, missile components, mobile electronic systems, papermaking machinery, plumbing and heating equipment, shoes, and vinyl products. Lawrence has a commission form of government. William J. Reid

LAWRENCE, DAVID HERBERT (1885-1930), was an English novelist and poet. His writings championed the idea that man should bring his instincts and emotions into balance with his intellect, which Lawrence believed had been overdeveloped. He upheld this doctrine, referred to as *romantic vitalism*, in such novels as *The Rainbow* (1915), *Women in Love* (1920), and *Lady Chatterley's Lover* (1928).

Lawrence, the son of a coal miner, was born in Eastwood. His novel *Sons and Lovers* (1913) reflects many of his youthful experiences there. During World War I, Lawrence and his German-born wife were accused of disloyalty and even of spying. In 1919, they became voluntary exiles from England. The settings of various novels show the range of Lawrence's travels. *Aaron's Rod* (1922) takes place in England and Italy, *Kangaroo* (1923) in Australia, and *The Plumed Serpent* (1926) in Mexico.

Grove Press

D. H. Lawrence

Other important books by Lawrence include two travel books, *Sea and Sardinia* (1921) and *Etruscan Places* (1932), and his *Collected Poems* (1928). His *Letters of D. H. Lawrence* (1932) are among the finest in literature.

Lawrence became a powerful influence in literature during the 1920's. He inspired a series of hectic memoirs which appeared soon after his death. These obscured his reputation as a writer for some years. But his works gained wide acclaim after World War II. Harry T. Moore

LAWRENCE, ERNEST ORLANDO (1901-1958), an American physicist, helped develop the *cyclotron*, a machine for accelerating atomic particles. He received the Nobel prize in physics in 1939 and the 1957 Enrico Fermi award of the Atomic Energy Commission.

Lawrence started construction of a huge cyclotron before World War II, and converted it during the war to separate the isotopes of uranium. In 1946, he completed this *synchrocyclotron*, which speeds particles to an energy of 400,000,000 electron volts. In 1948, this machine produced the first man-made *mesons* (see Meson). In 1954, he and other scientists completed the *bevatron*, a particle accelerator that produces energy up to 7,000,000,000 electron volts (see Bevatron). Lawrence was born at Canton, S. Dak. He studied at South Dakota, Minnesota, and Yale universities. Ralph E. Lapp

See also Bevatron; Cyclotron; Isotope; Synchrocyclotron; Uranium.

LAWRENCE, GERTRUDE (1901-1952), an English actress, achieved stardom in both England and the United States. She was admired for her sparkling performances in *Private Lives*, *Lady in the Dark*, and *The King and I*. She also played leading roles in *Susan and God*, *Pygmalion*, *Skylark*, and *Tonight at 8:30*. During World War II, she entertained soldier audiences in England, France, and the Pacific areas. She was born in London and started her stage career as a child. She first came to America in 1924. RICHARD MOODY

United Press Int.

Gertrude Lawrence

Historical Pictures Service

James Lawrence

LAWRENCE, JAMES (1781-1813), a United States naval officer, commanded the *Chesapeake* in an attack on the British ship *Shannon*, during the War of 1812. The *Shannon* easily captured the *Chesapeake*, and Lawrence was fatally wounded. His dying command, "Don't give up the ship," became a watchword of the United States Navy. Lawrence was born in Burlington, N.J., and joined the navy as a midshipman in 1798. In 1812, Lawrence took command of the *Hornet*, which captured two British ships. RICHARD S. WEST, JR.

LAWRENCE, MARJORIE (1909-), an Australian soprano, became noted for her singing in the operas of Richard Wagner. In 1941, while performing in Mexico, she was stricken by polio. Doctors said she would never recover. But with the help of her physician husband, Thomas King, who learned to give the exercises developed by Sister Elizabeth Kenny, Miss Lawrence made gradual progress. A year and a half after the attack, she was wheeled onto the stage of the Metropolitan Opera House in New York City, and, from a sofa, sang the role of Venus in *Tannhäuser*. Two years later, she made a 50,000-mile tour of Australia and the southwest Pacific, where she sang about 50 concerts, mostly for Allied servicemen. In 1946, she sang at the Paris Opera, where the French government gave her the Legion of Honor medal. Her autobiography, *Interrupted Melody* (1949), was made into a motion picture. Miss Lawrence was born in Dean's March, Australia. DANIEL A. HARRIS

LAWRENCE, SAINT. See ESCORIAL.

LAWRENCE, THOMAS EDWARD (1888-1935), a British soldier and writer, became world famous as LAWRENCE OF ARABIA. He was one of the most adventurous personalities of World War I. In *The Seven Pillars of Wisdom* (1926), he described his spectacular exploits in Arabia. A shortened version of his book appeared in 1927 as *Revolt in the Desert*.

Lawrence was born in Tremadoc, Wales. He attended Oxford University, where he studied archaeology and the Near East. When World War I started, Lawrence was working as an archaeologist for the British government. He was sent to Egypt to head the military intelligence department. Later, as a colonel, he helped organize the Arab revolt against Turkey, and became passionately devoted to the Arab cause. He won outstanding success as a leader of daring guerrilla raids. His military and diplomatic genius led to the Turks' defeat and the entry of the Arabs into Damascus, capital of Syria.

Lawrence refused all honors and decorations. But the Arabs hailed him as a hero, and he was called "the uncrowned King of Arabia." At the Versailles Conference in 1919, he unsuccessfully pleaded the cause of Arabian independence.

In 1921, Lawrence became adviser on Arab affairs to the British Colonial Office, but he was disappointed in the treatment of the Arabs. Feeling that he had betrayed his friends, he resigned the next year and enlisted as a private in the Royal Air Force under the name of J. H. Ross. His identity was discovered, and he transferred to the tank corps under the name of T. E. Shaw, because of the publicity that followed. In 1925 he returned to the R.A.F. He legally adopted the name of T. E. Shaw. Lawrence was killed in a motorcycle accident in England. G. E. BENTLEY

LAWRENCE COLLEGE is a coeducational liberal arts college at Appleton, Wis. Affiliated with the college, which was founded in 1847, is the Institute of Paper Chemistry, the only graduate school of its kind in the United States. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LAWRENCE OF ARABIA. See LAWRENCE, THOMAS E.

Thomas Edward Lawrence became famous as *Lawrence of Arabia*. British portrait artist Augustus John painted him in this role.

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LAWRENCIUM (chemical symbol, Lw) is a man-made radioactive element. It has an atomic number of 103. It is expected to be the last in the *actinide series* of the periodic table of the elements, but scientists predict that other elements will be discovered. Lawrencium was discovered in 1961 by four American scientists, Albert Ghiorso, Torbjørn Sikkeland, Almon E. Larsh, and Robert M. Latimer, at the Lawrence Radiation Laboratory of the University of California. They produced the element by bombarding californium, element 98, with boron ions from a heavy-ion linear accelerator. The isotope they obtained had a mass number of 257 and a half-life of eight seconds. TORBJØRN SIKKELAND

See also Element, Chemical (table); Radioactivity.

LAWSON, ROBERT (1892-1957), was an American illustrator and writer of children's books. He became prominent as an illustrator in 1936, with his pictures for *The Story of Ferdinand* by Munro Leaf. In 1941 he won the Caldecott medal for his picture book *They Were Strong and Good.* Lawson received the Newbery medal in 1945 for *Rabbit Hill.* The first book he wrote and illustrated was *Ben and Me* (1939).

Viking Press

Robert Lawson Illustrated *The Story of Ferdinand,* written by Munro Leaf. The story tells about a bull who preferred to sit under a cork tree and smell flowers rather than to fight.

Lawson was born in New York City. He studied art at the New York School of Fine and Applied Art. He and his wife, who also wrote and illustrated children's books, lived after 1923 at their home called "Rabbit Hill" in Westport, Conn. RUTH HILL VIGUERS

See also Literature for Children (picture, Georgie).

LAWSON, VICTOR FREMONT (1850-1925), was an American newspaper publisher and editor. He helped influence the development of journalism with his paper, the *Chicago Daily News.* He believed that a newspaper should be courageous, civic-minded, and honest. He bought controlling interest in the *Daily News* in 1876, after it had become a near failure in less than a year's operation. Under Lawson's management, the paper became a successful, widely respected publication. He was born in Chicago. I. W. COLE

LAWTON, Okla. (pop. 61,697; alt. 1,110 ft.), is the trading center for a rich agricultural and livestock region in the southwestern part of the state. For location, see Oklahoma (color map).

Products include cartons, foods, hats, and house trailers. Lawton also serves as a supply center for Fort Sill. Medicine Park, a well-known vacation resort, and the Wichita Mountains Wild Life Refuge are nearby. Lawton was founded in 1901. The first settlers bought lots at auction and set up tents.

The seat of Comanche County, Lawton has a mayor-council type of government. JOHN W. MORRIS

LAWYER is a man or a woman who represents members of the public in a court of law. He is also called an *attorney,* a *counselor,* or a *solicitor.* A person who seeks his services is called his *client.* In Great Britain, a lawyer who has the right to argue cases in the higher courts is called a *barrister.* A barrister appointed to represent the king is called a *king's counsel.* The lawyer's duty is to see that all the points of law and any facts that favor his client's case are brought to the attention of the court, and that justice is done.

A lawyer's duty to his client usually covers all legal matters, including contracts, wills, and business matters. A lawyer tries to avoid lawsuits by giving legal advice that will keep his client out of trouble. Legally, anyone may act as his own lawyer in any court. But authorities say that it is not wise for an untrained person to do so. They often quote the old saying, "A man who is his own lawyer has a fool for a client."

Learning to become a lawyer requires several years of study. Some law schools admit only students who have college degrees. In the United States, law school itself usually takes three years to complete. The graduate receives a Bachelor of Laws (LL.B.) or a Juris Doctor (J.D.) degree. Most states require lawyers to pass a state bar examination before they practice. THOMAS A. COWAN

Related Articles. For a list of biographies of lawyers in World Book, see the heading Lawyers and Jurists in the Biography section of the Reading and Study Guide. See also Court; Law; Public Defender; Retainer.

LAXATIVE, *LAK suh tiv,* is a medicine that hastens the emptying of the bowels. It differs from a purgative, which has a much stronger action. Laxatives are usually classified according to their effect on the body. Some, such as castor oil and mineral oil, act by lubricating the contents of the intestine. Others, such as the various salts and powders, act on the tissues of the intestine, causing water to return into the intestine. The water pouring into the intestine moistens the waste materials and causes them to move. Sudden and extreme loss of water by the tissues is often harmful. Laxatives should never be taken over long periods of time, because they can be habit-forming. AUSTIN EDWARD SMITH

Related Articles in World Book include:

Cascara Sagrada
Castor Oil
Constipation
Epsom Salt
Glauber's Salt
Magnesia
Mineral Oil
Phenolphthalein

LAXNESS, HALLDÓR KILJAN (1902-), an Icelandic novelist, won the 1955 Nobel prize for literature. He was the first Icelander to win this award. His novels offer frank pictures of life in Iceland, often with fascinating mixtures of tragedy and humor. Laxness created unforgettable figures from humble and socially unimportant people. His novels include *Salka Valka,* the story of a girl in a fishing village; *Independent People,* a powerful portrayal of man's struggle with the soil; and *Bell of Iceland,* a story of Iceland's hardships under Danish rule. Laxness was born in Reykjavík. EINAR HAUGEN

LAY, WILLIAM PATRICK. See Alabama (Famous Alabamians).

LAYERING. See Propagation.

LAYOUT. See Advertising (Advertising Terms; Printed Advertisements); Commercial Art.

LAZARUS was the brother of Mary and Martha of Bethany. He was the youngest member of a family that Jesus loved (John 11: 1-44). Lazarus became ill and died while Jesus was preaching beyond the River Jordan. Jesus came to his tomb four days later and said, "Lazarus, come forth." The Bible says that Lazarus came out of the tomb alive. Lord Tennyson and Robert Browning used this story in poems, and Eugene O'Neill wrote a play about it. The name Lazarus also belonged to a beggar in Luke's parable of the rich man and Lazarus (Luke 16: 19-31). FREDERICK C. GRANT

LAZARUS, EMMA (1849-1887), an American poet and essayist, wrote the sonnet inscribed on the pedestal of the Statue of Liberty. A full text of the sonnet appears in the article LIBERTY, STATUE OF. Miss Lazarus, the daughter of wealthy parents, was born in New York City. She worked as a philanthropist, and organized relief for persecuted Jews immigrating to the United States from Russia. PETER VIERECK

LAZEAR, JESSE WILLIAM (1866-1900), an American physician, became known for his work in controlling yellow fever. In 1900 an outbreak of yellow fever occurred in Havana, Cuba. Lazear was appointed a member of the Yellow Fever Commission along with Walter Reed, James Carroll, and Aristides Agramonte, to study the disease. The four men proved that the bite of a mosquito transmitted yellow fever. During the course of their experiments in Cuba, Carroll submitted to the bite of an infected mosquito, developed yellow fever, and recovered. Lazear was bitten accidentally by an infected mosquito and died of yellow fever. Shortly after his death, the disease came under control.

Lazear was born in Baltimore, Md., and graduated in medicine from Columbia College. NOAH D. FABRICANT

LAZURITE. See LAPIS LAZULI.

LEACH. See CONSERVATION (Soil Conservation).

LEACOCK, STEPHEN BUTLER (1869-1944), was a Canadian humorist and educator. He wrote many serious and scholarly books about political science, including *Elements of Political Science* (1906), *The British Empire* (1940), and *Canada* (1941). He also wrote biographies, such as *The Mariner of St. Malo* (1914), *Mark Twain* (1932), and *Charles Dickens* (1933); and theoretical books about humor.

But Leacock achieved world-wide fame as a practicing humorist. Beginning with *Literary Lapses* in 1911, he published more than 30 books of hilarious essays and sketches. These included *Nonsense Novels* (1911), *Sunshine Sketches of a Little Town* (1912), *Arcadian Adventures of the Idle Rich* (1914), and *Too Much College* (1939).

Leacock was born at Swanmoor, England, and came to Canada as a boy. He attended Upper Canada College, the University of Toronto, and the University of Chicago. From 1903 to 1936 he taught political science at McGill University. DESMOND PACEY

Stephen Butler Leacock
Wide World

LEAD (chemical symbol, Pb) is a soft, heavy metallic element that combines with other metals to make many of the most useful objects in the world. The ancient Romans called this metal *plumbum*. From this Latin word for *lead*, we get our English word *plumber*, which originally meant a *worker in lead*. Latin also gives us the chemical symbol, Pb. The Romans used lead for water pipes and other purposes much as we do today.

Properties of Lead

The expression "as heavy as lead" is a common description for anything of great weight. For a long time, lead was one of the heaviest known metals. It is $11\frac{1}{3}$ times as heavy as an equal volume of water. Among the common metals, only gold is heavier. Lead has a bluish-gray color, and is so soft that it can be scratched with a fingernail. When the metal is cut, it gleams silver-white, but it quickly darkens in the air. Lead melts at a temperature of 621°F., which is above the melting point of tin, but below that of zinc. Its atomic weight is 207.21, and its atomic number is 82.

Lead compounds are poisonous. Lead poisoning was once common among persons working with lead. But today various safeguards have been developed.

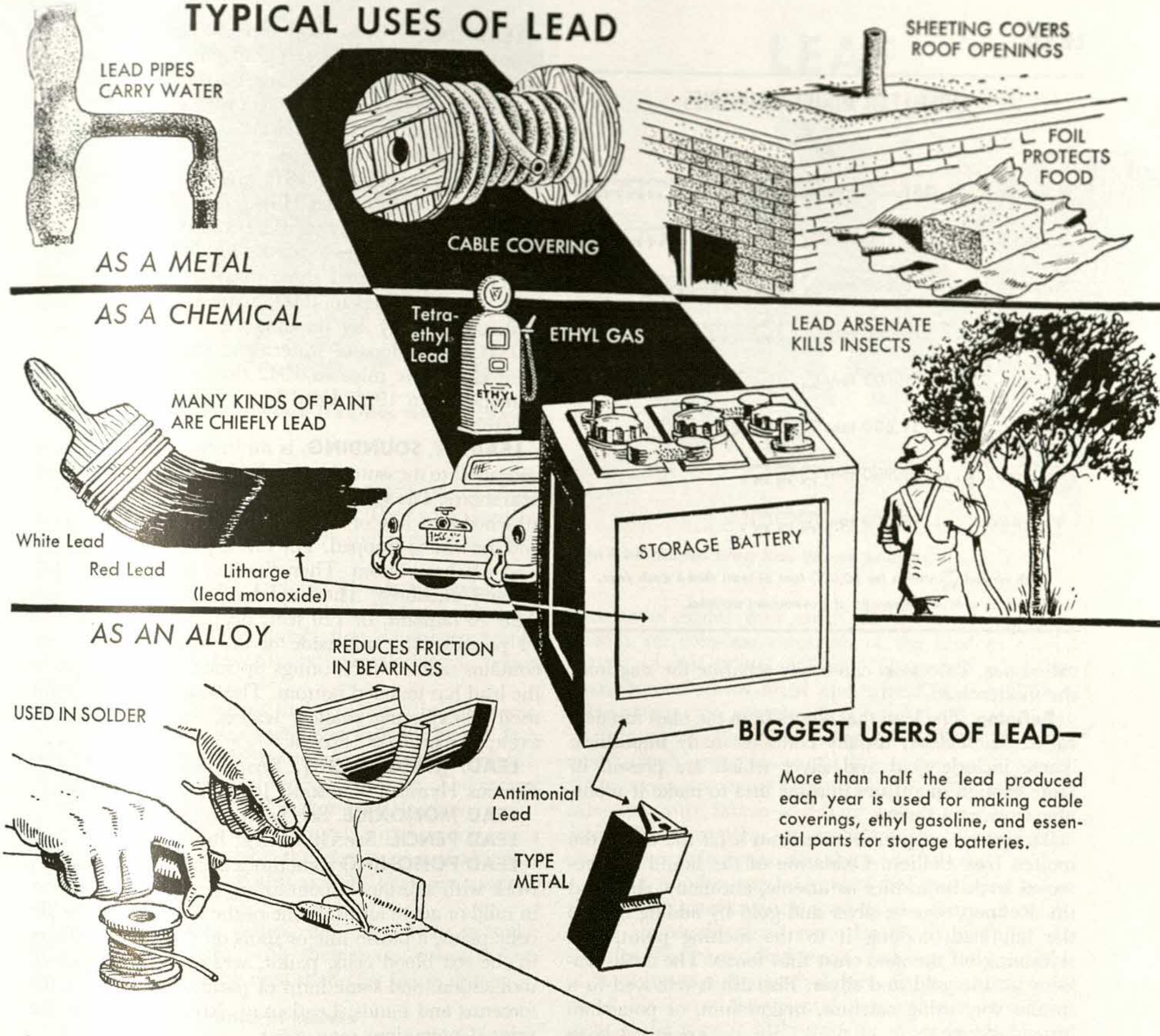
Uses of Lead

The pipes that carry water from city mains to household faucets are often made of lead. Lead also is used as a lining for tanks, for insulating sheathing on electric cables, and for plates in storage batteries. In atomic energy, scientists use lead to shield workers from harmful radiation. Lead alloyed with tin makes *solder*, a binding agent for uniting several metals. Lead is alloyed with antimony to make bullets and printing type. Pewter is made from an alloy of lead and zinc. Chemical dyes are made from lead acetate, or *sugar of lead.* Carbonate of lead, or *white lead*, is an ingredient of many paints. *Red lead*, a compound of oxygen and lead, is also used in the making of paints. *Lead chromate*, usually called *chrome yellow*, is another paint pigment. *Litharge*, another compound of oxygen and lead, is used in making fine glass.

How Lead Is Obtained

Lead Ores. Lead is found in veins and masses in limestone and dolomite. It is usually found with deposits of other metals such as zinc, silver, copper, and gold. The most common lead-ore mineral is *galena*, a combination of lead and sulfur also called *simple sulfide of lead.* Another ore mineral in which lead is found combined with sulfur is *anglesite*. *Cerussite* is a lead-ore mineral which contains carbon. All three of these ore minerals are found in the United States, which is one of the chief lead-mining countries. The principal lead-producing states include Missouri, Idaho, Utah, and Colorado (see MISSOURI [Mining]). Australia is the leading lead-producing country. Other important producers include Russia, Mexico, and Canada.

Mining Lead. Miners always take lead from below the surface of the ground. Some veins of lead lie as deep as several thousand feet. But most lead deposits occur close to the surface. In the mine, workers try to separate the lead-bearing minerals from the barren rock as much as possible during the mining process. The ore is then brought to the surface for further *concentration*. This



TYPICAL USES OF LEAD

BIGGEST USERS OF LEAD—

More than half the lead produced each year is used for making cable coverings, ethyl gasoline, and essential parts for storage batteries.

involves coarse crushing followed by grinding in water.

If the mineral veins separate from the rock cleanly, then the workers can concentrate the ore by taking advantage of the greater weight of the mineral compared to the rock. Coarse lumps are separated by *jigging*. In this process, the crushed ore is *agitated*, or shaken, in water with a vertical motion. This permits the heavy lumps to settle to the bottom and the lighter rock to remain on top. For more finely crushed ore, when the rock is crushed to sand, another method is used. The sand and water mixture flows across a vibrating table that cleanly separates the heavy mineral from the fine rock sand.

For the most finely crushed ore, workers use a method called *flotation*. This method is chiefly used with galena, because the mineral is finely dispersed through the rock containing it. In flotation, workers use *slurry reagents*, such as soap, to float the heavy mineral away from the lighter powdered rock. Slurry reagents form frothy bubbles that attach themselves to the mineral and float them to the surface away from the sand. By using the right kind of froth former, and with the help of special chemicals, mining companies can make separate concentrates of copper and lead when they are mixed in the same ore. This separation makes the processing of each of the metals more economical.

Smelting is the process of producing crude lead. After the ore has been concentrated at a mill near the mine, it goes to a smelter. Here, in the case of galena, the first step involves removing the sulfur from the mineral. Roasting in air causes the sulfur to escape as a gas, sulfur dioxide. This roasting process converts the lead to lead oxide.

Frequently, processors combine the roasting process with a sintering process (see SINTERING). This converts the finely divided concentrates into large lumps more suitable for the blast furnace, which does the next job in smelting.

A lead blast furnace consists of a vertical shaft. The *sinter*, or lead oxide, mixed with lump coke is fed into the top of the furnace. The mixture gradually sinks down the shaft while air blows up from the bottom. This causes the coke to burn intensely, and also to react with the lead oxide to produce liquid lead metal. The metal flows from the bottom of the furnace along with other material that has melted into a lighter liquid

CHIEF LEAD MINING COUNTRIES

Country	Tons
Australia	351,600 tons
United States	324,100 tons
Russia (est.)	296,300 tons
Mexico	228,000 tons
Canada	189,700 tons
Peru	139,600 tons
Morocco	99,900 tons
Yugoslavia	98,500 tons

Each symbol ⛏ stands for 30,000 tons of lead mined each year. Based on a 4-year average of government statistics.

called *slag*. Processors can easily separate the slag from the molten lead.

Refining. The lead that comes from the blast furnace, called *base bullion*, usually contains many impurities. These include gold and silver which are present in large enough quantities in some ores to make it profitable to extract them.

To remove copper, refiners skim it off the top of the molten base bullion. Oxidation of the liquid lead removes such impurities as arsenic, antimony, zinc, and tin. Refiners remove silver and gold by adding zinc to the hot lead, cooling it to the melting point, and skimming off the zinc crust that forms. The crust contains all the gold and silver. Bismuth is removed in a similar way using calcium, magnesium, or potassium instead of zinc.

Albert J. Phillips

Related Articles in World Book include:

Alloy
Galena
Lead Poisoning
Litharge
Metal
Metallurgy
Paint
Red Lead
White Lead

CHIEF LEAD MINING STATES AND CANADIAN PROVINCES

State or Province	Tons
British Columbia	149,400 tons
Missouri	122,200 tons
Idaho	63,400 tons
Utah	46,200 tons
Newfoundland	25,200 tons
Colorado	17,700 tons

Each symbol ⛏ stands for 30,000 tons of lead mined each year. Based on a 4-year average of government statistics.

LEAD, *leed,* S.Dak. (pop. 6,211), is the site of the Homestake Mine, the largest gold mine in the Western Hemisphere. The town stands in the Black Hills of western South Dakota, 5,120 feet above sea level. Pine-clad mountain peaks surround it. For location, see South Dakota (color map).

Lead was founded in 1876, after the mine was discovered during the Black Hills gold rush. The Homestake Mining Company owns most of the land in Lead, and permits employees to use building sites free of rent. The town has suffered three disasters. Fire destroyed most of its buildings in 1900; a mine fire in 1907 was extinguished only by flooding the mine with about 300,000,000 gallons of water; and the federal government closed the mine in 1942 during World War II. It reopened in 1945. Lead has a commission form of government.

Everett W. Sterling

LEAD, *led,* **SOUNDING,** is an instrument that sailors once used to measure the depth of water in harbors and near shores. The sounding lead is a tapered lead cylinder attached to a line of rope or wire. The ship is stopped and the lead is dropped. The line is played out until the lead touches bottom. Then the line is marked, pulled in, and measured. The *hand lead*, used in waters less than 20 fathoms, or 120 feet, deep, weighs from 5 to 14 pounds. The underside of the lead is hollow and contains tallow which brings up mud or ooze to prove the lead has touched bottom. The sounding lead is still used in exploring shallow waters. See also Fathometer; Plumb Line; Sonar.

E. G. Straus

LEAD, KINDLY LIGHT. See Hymn (Some World-Famous Hymns); Newman, John Henry Cardinal.

LEAD MONOXIDE. See Litharge.

LEAD PENCIL. See Graphite; Pencil.

LEAD POISONING sometimes occurs in persons who work with substances containing lead. It may appear in mild or acute forms. Some of the chief symptoms are colic pains, a bluish line or spots on the gums, changes in the red blood cells, pallor, weakness, constipation, indigestion, and some form of paralysis, usually in the forearms and hands. Lead may also be present in the urine. Convulsions may occur.

Lead can be taken into the body by breathing fumes, dust, vapor, or mist from lead. Some types of liquid lead, such as *tetraethyl* lead, can enter the body through unbroken skin.

Hyman S. Rubinstein

See also Painter's Colic.

LEADER. See Fishing (Standard Fishing Equipment).

LEADER, GEORGE M. See Pennsylvania (Famous Pennsylvanians).

LEADVILLE, Colo. (pop. 4,008), is often called *Cloud City* because it is the highest incorporated city in the United States. This mining center lies 10,200 feet above sea level, about 80 miles southwest of Denver. For location, see Colorado (color map). It was named Leadville because of the large quantities of lead ore in the area. Silver, gold, iron, and copper are also mined in the Leadville region. The largest molybdenum mine in the world lies 13 miles northeast of the city.

The discovery of rich silver-lead mines brought thousands of fortune seekers to Leadville after 1878. The city was incorporated in 1878. Leadville has a mayor-council form of government, and is the seat of Lake County.

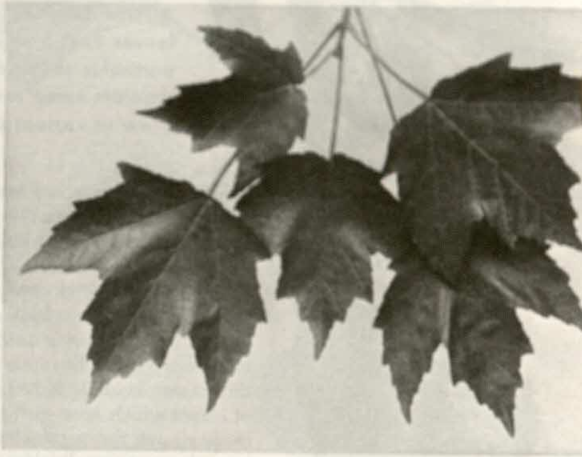
Harold H. Dunham

LEADWORT. See Plumbago.

LEAF

Western Photo and Science Service: L. W. Brownell

The Redwood Tree Has Needle Leaves.



The Red Maple Tree Has Broad Leaves.

LEAF. Trees, bushes, and most other kinds of plants grow leaves in countless numbers. The work done by leaves is so important that every living thing on earth depends upon it.

Every leaf is a small "factory." It uses air, water, and sunlight to make food for the plant. Without this food, no plant could live. Animals that eat plants would starve. And, without plants and animals, human beings could not live.

The food which leaves make is stored in the stems, in the roots, and in the seeds and fruits of plants. It is this food that provides the energy for seeds to sprout, for flowers to bloom, and for fruits to form. The energy stored in food from plants makes animals grow.

Only recently have men learned to make a few kinds of machines that work by the energy of sunlight. But leaves have always had this power. They are nature's own "sun machines."

Leaves have other values, too. They help to make the outdoors beautiful with their many colors during the year. They provide cool shade for living things.

Kinds of Leaves

Leaves of Broad-Leaf Trees. The word *leaf* may make us think right away of an oak leaf, a maple leaf, or some other common tree leaf. These are the leaves of broad-leaf trees. Most of the broad leaves turn from green to bright colors in the fall.

Leaves of Grass. The greenest leaves, and the kind there are most of, are the leaves of grass. Grass leaves can be cut off but will keep growing. The roots add material to the bottom of the stem, making the leaves grow. Most other kinds of leaves will not grow if you cut off their tips. The fact that grass grows from the roots makes it possible for us to mow the lawn.

Needle Leaves. The leaves of pine trees, and of other needle-leaf trees, are narrow, rather than broad and flat like those of a maple. But they are green leaves just the same, and they make food just as other leaves do. A needle leaf is so narrow that it makes little shade. This is important, because every leaf must have some sunlight. Pine needles may stick out at all angles around the branch, yet some sunlight can filter through them and reach the other needles.

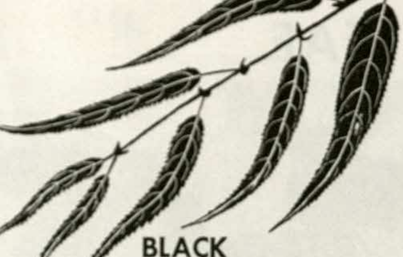
Leaves That Protect the Plant. Some leaves have unusual and special forms, and are useful to their plants in many ways besides making food. The tough waterproof scales that cover the buds of trees and bushes are common examples of the kind of special leaves we call *protection leaves*. These bud scales are small special leaves fitted and "glued" together. They often overlap like shingles. Bud scales protect the living parts inside the bud. Pine cones are made up chiefly of small, tough protection leaves. When the cone is young, these leaves are moist and green and make food. But later they turn brown and hard and protect the seeds inside the cone. When the seeds are ripe, the pine-cone scale leaves swing open and the seeds fall out.

Bracts. Another special kind of leaf grows just below flowers like asters, which form small, compact heads. These are usually small green leaves, overlapping like shingles. They are called *bracts*. You can find examples of bract leaves underneath daisies, asters, thistles, goldenrod, black-eyed Susans, and many other flowers. They seem to form neat little cups or vases in which the flower heads are growing. Dogwood bracts grow so large and are so white that people think they are the flower petals, although they are really white leaves. The true dogwood flowers are the tiny yellow clusters in the center of the white leaves. Bract leaves of poinsettia also seem to make a large flower, beneath the small yellow flowers. These leaves turn bright red.

Leaves That Keep the Plant Warm. The skunk-cabbage flower is surrounded by one of the most unusual leaves to be found among our common wild flowers. This plant comes up in cold swampy places in late winter when nights are still freezing. A leaf, called a *spathe*, formed like a heavy curving hood, protects its flowers. The spathe acts like a tiny heating plant. It is mottled with red splashes which let the red rays of the sun filter through and warm the pocket of air inside the hood where the flowers are. This keeps the temperature inside the skunk-cabbage leaf warmer than the cold surrounding air. Another odd leaf which protects a flower is that of the well-known springtime Jack-in-the-pulpit. This broad leaf is rolled lengthwise. The flower stands in an opening in the leaf like "Jack" in a pulpit. The outer end of the leaf curls over and makes a tent over its head. The lining of this leaf

KINDS OF LEAVES

A "tree detective" can identify a tree by its leaves. Each kind of tree grows leaves of a particular shape, design, and arrangement. Here are some examples, from trees which grow in various parts of the United States.


BLACK WILLOW

COTTONWOOD

SHAGBARK HICKORY

DOGWOOD

BEECH

BLACK OAK

BUR OAK

covering the flower has wide, deep, red-purple stripes that let in the warmer rays of the sun. The green part of the leaf between the stripes makes food as ordinary leaves do.

Leaves That Stick and Scratch. Plants sometimes have sharp thorns, spines, and prickles which help to protect the plants from people and animals. Thorns are long, sharp twigs. But spines, which look somewhat like thorns, are actually leaves. Prickles are leaves or parts of leaves which have grown in a special way. Barberry bushes have sharp prickles. Thistle bract leaves have long sharp spines. Prickles grow out from the stems or leaves of blackberries, raspberries, and other plants.

The leaves of the cactus are clusters of little prickly scales. They are attached to heavy, broad stems. The cactus stems do the food making which is done by leaves in other plants.

Leaves That Catch Animals. Among the most unusual leaves are those of insect-catching plants. These leaves make food in sunlight as ordinary leaves do. In addition, they are able to catch insects, little frogs, and any other tiny animals that may be flying or crawling near by. These plants kill, dissolve, and eat the animals they catch.

Butterworts have oval yellow leaves that lie flat on the ground. Their top surfaces are covered with a shiny substance like butter, which catches the small animal visitor that lights on it. Then the edges of the leaf roll inward so that the victim is held like something rolled up in a rug.

Venus's-flytrap and the pitcher plant are famous throughout the world for their amazing insect-catching leaves. See PITCHER PLANT; VENUS'S-FLYTRAP.

The Biggest Leaves. Banana leaves grow rapidly to great size. They may get to be eight to ten feet long and one to two feet wide. (See BANANA.) A giant relative of the banana in Madagascar, an island east of Africa, has leaves 20 feet long. This tree is called the *Traveler's Tree*. The huge leaves pull up so much water from the ground that, when a leaf stem is cut, sap spurts out like a spring of fresh water. This sap provides a good drink for the thirsty traveler. One kind of South American palm tree has a leaf over twenty-six feet long and five feet wide. This is the world's biggest leaf.

An amazing floating leaf that you may see in parks and botanical gardens is that of the giant round water lily. This plant comes from India, and is named *Victoria regia* after Queen Victoria. A single leaf of this giant lily may be six feet across, and strong enough to hold a boy or girl like a raft. Another astonishing round leaf has been discovered in the Andes Mountains on a tree named *Gunnera*. This leaf looks like an enormous beach umbrella about 8 feet across.

The Smallest Leaves. The smallest leaf of a plant that produces flowers and seeds is that of a duckweed plant called *Wolffia*. Wolffia grows in ponds. Its leaf is

JUNIPER (Red Cedar)

SUGAR MAPLE

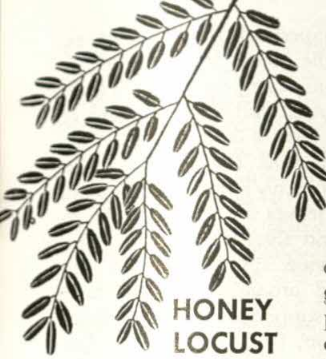
RED MAPLE

SMOOTH SUMAC

CHERRY

AMERICAN ELM

SPRUCE



only a pinpoint in size. But so many of these plants may grow in the water that they color the surface of the pond green. Strangely, these smallest of all the leaves of flowering plants are not flat, but round or lumpy. Through a magnifying glass, Wolffia leaves look like tiny green potatoes. This floating leaf is the entire plant. It has no roots or stem. But every so often a little flower, without petals, bursts through the upper surface of the leaf lump and forms a seed.

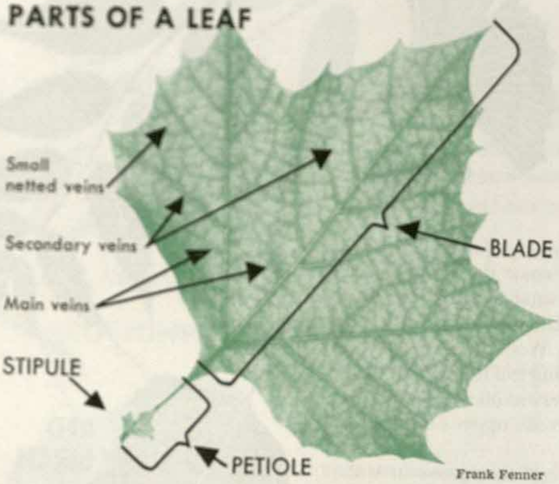
The *diatom* is also a tiny leaf that grows in water. There are probably more diatom leaves than any other kind in the world. A diatom produces no flowers or seeds, and so it is not often called a leaf. But it makes food with green food-making cells as ordinary leaves do. The diatom leaf is invisible without a microscope. Yet it grows in every drop of water near the surface of the oceans, and in many fresh-water ponds also. The diatom is considered perhaps the most important food factory on earth. The diatom leaf is made of only one cell, which has a hard, transparent crystal cover. This cover has beautiful and marvelous markings. There are so many diatoms, and they are so widely distributed in the oceans around the world, that diatoms provide about nine tenths of the food of fish and other animals of the sea. Indirectly, diatoms also are the source of much of the food of man, and of birds which live on seafood.

The Parts of a Leaf

The Blade. There are three main parts of a leaf. They are the *blade*, the *stem* or *petiole*, and the *stipule*. The broad part of a leaf, which holds the green food-making cells, is called the blade. A leaf which has only one blade is called a *simple leaf*, even though the blade may have deep V's along its edge, or some other fancy outline. Another style of leaf has a number of small blades or leaflets, which are usually lined up in two rows on each side of a stem. This is called a *compound leaf*. The stem of a compound leaf is called the *midrib*. Leaves of garden peas, locust, and ailanthus are good examples of compound leaves. Some compound leaves have leaflets which are not lined up in rows but spread out like a fan. Virginia creeper vine and horse chestnut are beautiful examples of fan-shaped compound leaves. Many plants, including clovers, wood sorrel, and poison ivy, have compound leaves with only three leaflets spreading out from the tip of the stem.

A leaf must have lots of water for its food making and to keep a stream of sap moving through the growing plant. All this water comes from the earth, where it is collected by the roots. A leaf needs pipe lines to carry sap and water. The undersurface of the typical leaf blade shows veins. These are the branches of the plant's pipe-line system. The main vein in a simple leaf may form a large, easily seen midrib the length of the leaf. The veins keep branching until they be-

PARTS OF A LEAF



Frank Fenner

come so small you cannot see them with the naked eye.

Leaves make food only in daylight, but water flows into leaves day and night. It evaporates from the surfaces of the spongy leaf cells, and escapes into the outer air through tiny air holes. A leaf is somewhat like the nozzle of a garden hose, spraying out invisible water vapor through the air holes. Because there are so many leaves (an apple tree may have a hundred thousand, a large elm several million), the amount of water a tree collects from the ground and delivers to the air through its leaves is enormous. This process of giving off water through the leaves is called *transpiration.* An acre of grass in a damp uncut meadow releases about six and one-half tons of water a day. An elm may give off a ton of water a day.

Veins not only serve as pipe lines, but also are the skeleton for a leaf. They are tougher and stiffer than the soft green tissue around them. They help to keep the leaf from collapsing.

The Stem, or Petiole. The blade stem is called the *petiole.* A leaf petiole is far more interesting than it looks at first glance. It is not merely a "handle" to hold the leaf to the plant. It must also bring water into the leaf and carry food in liquid form out of the leaf to all parts of the plant. A petiole is made of tiny pipe lines held together tightly like a handful of drinking straws.

Another remarkable fact about petioles is the way they grow to different lengths. A stem becomes extra long where it has to hold its leaf blade out farther to reach the sunlight. But the petiole stays short if no other leaf blades cut off the sunlight. A petiole will also twist around so as to hold the blade with its broad top side to the sun. Because of this odd behavior of petioles, the leaves on a tree form a pattern in which few leaves are shaded by other leaves. You can see this pattern by standing under a tree and looking up at the leaves outlined against the sky, or by looking at a leafy bush. The leaf pattern is called *leaf mosaic.*

The base of the petiole is wide, and has a firm grip on the twig of its tree, bush, or flower stem. The tough stem and the network of veins in the leaf help the leaf withstand winds and storms.

The Stipules. In addition to the blade and petiole, the leaves of some plants have another part, called the *stipule.* Most stipules are shaped like tiny extra leaves. Such stipules open before the blade does, and help it grow. They add to the food-making power of the blade. Rose leaves have fancy stipules that look like pairs of little leaves attached to the base of each petiole.

Other stipules have special uses. The stipules on the black locust tree are pairs of heavy spines. The stipules of magnolia and tulip-tree leaves act as bud scales to protect the winter buds, and then fall off early after the bud opens. Smilax, a vine, turns its stipules into long wiry forms that wind around twigs and hold the climbing plant up on its support. It keeps the climbing plant's flexible stem from being torn down when the wind jerks it violently.

The Leaf as a Food Factory

Inside a Leaf. It is hard to realize that there is space inside a leaf. A leaf looks solidly green, and is often as thin as a piece of paper. But if we look at a leaf through a microscope, we see that a leaf has a wonderful low-roofed room inside, between its upper and lower surfaces. A great deal of sunlight pours through the transparent "roof," or top surface. This top surface of the leaf is called the *epidermis.*

The space inside a leaf is a well-planned food factory. It has water coming from the ground, air coming in through countless holes, and light flooding the room through the transparent roof. Just below the epidermis are long slender cells like pillars holding up the roof. They are called *palisade cells.* Sunlight which strikes the top of the leaf floods the palisade cells with light. Below the palisade cells are thicker cells of irregular shape, loosely put together with air spaces between them. These are the *spongy cells.* Their chief work is to unite air and water. They also receive some sunlight. Tiny air holes, so small you must look through a microscope to see them, are in the underside of the leaf, or "floor" of the room. These holes are valves that open and close to bring in air and to give off water. They are called *stomata* (*little mouths*). One valve is called a *stoma.* Stomata usually open in daylight and close in darkness. The leaf requires more air when its food factory is operating, so the stomata stay open in sunlight. There are countless numbers of stomata —many thousands to the square inch of leaf surface. An apple-tree leaf may have 47,000 stomata in a square inch of its lower surface; a poplar leaf has about 18,000; and an oak leaf, over 100,000. Some leaves have the stomata in their upper surfaces. The water lily is an example. It must have its air holes in the upper surface because the lower surface is always in water.

"Magic" Chlorophyll. With all its equipment and supplies of raw materials, a leaf could not make food without the magic chemical we call *chlorophyll.* The name *chlorophyll* comes from two Greek words, meaning *light-green leaf.* Chlorophyll is in the form of tiny green specks clustered against the inside walls of the palisade cells and spongy cells in the leaf. They give the leaf its green color. Light striking these chlorophyll specks starts their food-making action. This process of food making is called *photosynthesis.* See CHLOROPHYLL.

Man plants leafy food factories for himself when he plants wheat fields, corn fields, vegetable gardens, and orchards. It takes about fifty leaves to make one medium sized apple. Thirty leaves make the food stored in an average sized peach. Fifteen leaves can make the food packed into a cluster of grapes. It takes about a dozen huge banana leaves to make a bunch of bananas, which may contain sixty pounds of nourishing food.

When man changes materials by chemistry, he needs furnace heat, boiling vats, and high pressures. Nature's green leaf works much more efficiently. The food-making process in leaves goes on at ordinary temperatures and pressures when chlorophyll and sunlight are present. The leaf factory takes tons of carbon out of water and air and changes the carbon into starch, sugar, and oils.

Leaves That Grow in Dim Light are able to make food better in the shade than in bright sun.

Many pine-needle leaves can work well in dim light. Shrubs like witch hazel, which grow under tall trees, or young seedling trees of a woods, can also make food where light is dim. Some leaves fold, and stop their food making, when strong sunlight strikes them. A kind of moss which grows in caves where the light is dim has tiny lens crystals on its leaves that collect and focus what little light there is.

Plants That Have No Chlorophyll, such as mushrooms, do not make food as green-leaf plants do. They simply use food which has already been prepared by green-leaf plants.

The Life Story of a Leaf

Oaks may live for hundreds of years, sequoias for thousands of years. But the life-giving part of the tree—the leaf—is always fresh and young. Long before a tree's leaves have fallen, the tree has started a new year's "crop" of leaves. As soon as a new leaf is fully spread out, another bud to replace it the following year grows in the crotch just above the point where the leaf stem joins the twig.

Evergreens and needle-leaf trees keep getting fresh leaves, too. Their leaves are continually falling off, a few at a time, all year, and fresh leaves are appearing.

How the Leaf Begins in the Bud. The typical leaf is born inside a bud. The leaf bud contains a tiny leaf, or leaves, a fraction of an inch long and folded up tightly. In the Temperate Zones, a woody plant that drops its leaves in winter has its next year's buds all made by the end of the summer. Its growth then stops for a time. The buds remain *dormant*, or inactive, during the cold months, until warm sunlight and plenty of water bring out the leaves in the spring.

The Fully Grown Leaf. Within a few weeks after the leaf is released from its bud, the blade is fully grown. During the warm sunny months, the leaf food factory is in full operation. As summer advances, the bright green of the young leaf turns darker, becoming a deeper, bluer green. Then an odd development begins in the petioles of the leaves of maple, elm, ash, and most other broad-leaf trees and shrubs of the Northern States. Where the petiole joins the twig, a ring of cells begins to turn into cork. These cork cells are called *incision* cells.

Why the Leaf Turns Color in Autumn. In late summer and early fall, this ring of corky cells grows across the petiole, slowly blocking the pipe lines with their flow of water and food to and from the blade. By early October, the vein system of the leaf is completely cut off. Without water, the leaf stops making food. Green chlorophyll disappears. The leaf now dangles from a petiole that has ceased to supply it, but merely attaches it temporarily to the tree. For a few days the leaf hangs on. During those few days beautiful chemical colors, which had been lurking in the galleries of the leaf, are revealed. Some new chemicals are formed.

A bright yellow pigment called *xanthophyll*, which had been covered up by the green of chlorophyll, now becomes visible. Another substance called *carotene* (carrots contain much of this chemical) flashes out with red or orange hues. Deep reds and purples may show up in a chemical compound, *anthocyanin*, that is now freshly formed.

Here we have the secret of fall foliage colors. A busy chemical laboratory, with its flow of raw materials cut off, loses its green color and reveals hidden yellow, red, and orange, or newly formed purples.

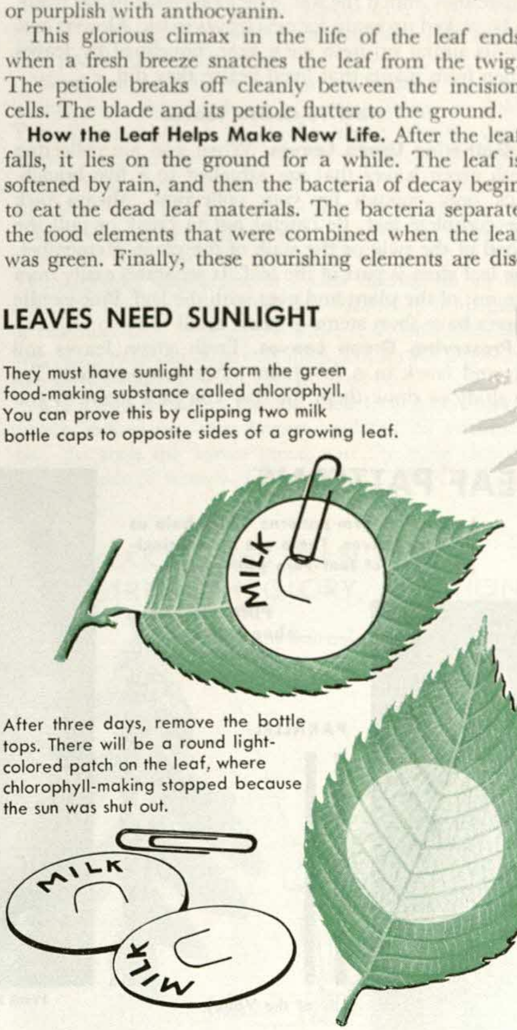
The fall color of each kind of tree or shrub depends on which of the three compounds it has the most of, after the chlorophyll goes. Birch, tulip tree, and elm turn yellow with xanthophyll. The sugar maple turns golden, bright orange, or red with carotin. Sweet gum, sassafras, dogwood, and ash turn deep red or purplish with anthocyanin.

This glorious climax in the life of the leaf ends when a fresh breeze snatches the leaf from the twig. The petiole breaks off cleanly between the incision cells. The blade and its petiole flutter to the ground.

How the Leaf Helps Make New Life. After the leaf falls, it lies on the ground for a while. The leaf is softened by rain, and then the bacteria of decay begin to eat the dead leaf materials. The bacteria separate the food elements that were combined when the leaf was green. Finally, these nourishing elements are dis-

LEAVES NEED SUNLIGHT

They must have sunlight to form the green food-making substance called chlorophyll. You can prove this by clipping two milk bottle caps to opposite sides of a growing leaf.



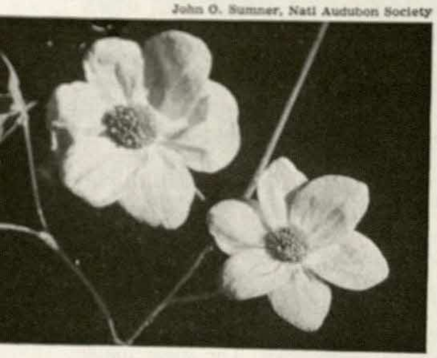
After three days, remove the bottle tops. There will be a round light-colored patch on the leaf, where chlorophyll-making stopped because the sun was shut out.

TYPES OF LEAVES

Nature has made many different kinds of leaves. Some make food for the plant. Others perform special tasks.

Dogwood has big white leaves that look like flower petals, in addition to its green leaves. These white leaves are "billboards" attracting insects to tiny yellow blossoms in their center.

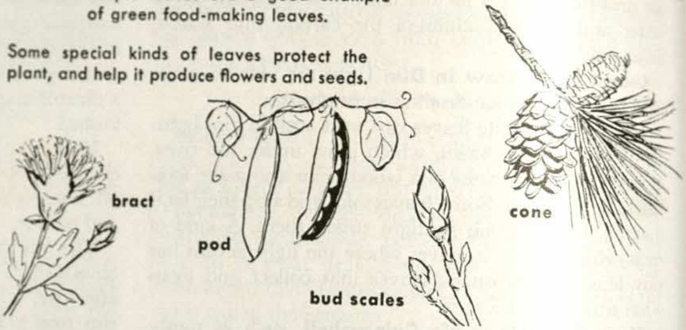
John O. Sumner, Natl Audubon Society



Lynwood M. Cha

Maple leaves are a good example of green food-making leaves.

Some special kinds of leaves protect the plant, and help it produce flowers and seeds.



solved by rain water and washed back into the earth, where they enrich the soil. The food elements are ready to be picked up again for new leaves to use. Flowers and plants spring up fresh each year, nourished by leaves fallen from plants that lived before they did.

How To Collect Leaves

Gathering Green Leaves. When you are collecting fresh green leaves that are attached to a live branch, pick only enough for your collection. Always pick the complete leaf. Be careful not to break or pull the wood of the twig or the stalk of the plant. Remember, the leaf stem is part of the leaf. It separates easily from the rest of the plant and goes with the leaf. Pine-needle leaves have short stems or none at all.

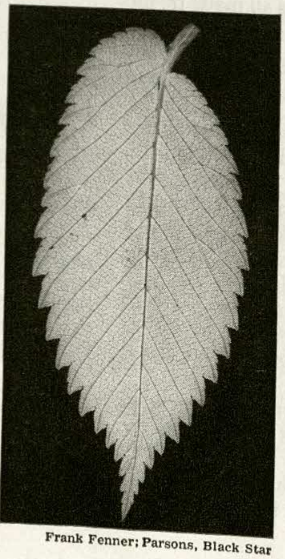
Preserving Green Leaves. Fresh green leaves roll up and crack in a few hours after being picked. Try to study or draw them the day you pick them. If you want to keep them longer, or to mount them on cardboard or in an album, you must *press* them by placing them flat with a weight over them.

Finding Leaves with Beautiful Shapes. A close study of leaves will reveal how many kinds of beautiful leaf shapes there really are. Many leaves are ovals—long narrow ovals like *willow* leaf, or fat ovals like *magnolia*, or medium ovals like *apple* or *cherry*. *Sweet-gum* leaves are star-shaped. *Sugar maple*s have leaves that make you think of a hand with its fingers stuck out. There also are leaves shaped like hearts. Two of the loveliest heart-shaped leaves are those of the *redbud* and *catalpa*. One plant that grows in shallow water is called *arrowhead*, because its leaves are sharp-pointed at one end, with two prongs or points at the other. These leaves look like big Indian arrowheads. *Water lily* leaves are often round like a pie with a piece cut out. They float on the surface of water and catch the full sunlight.

LEAF PATTERNS

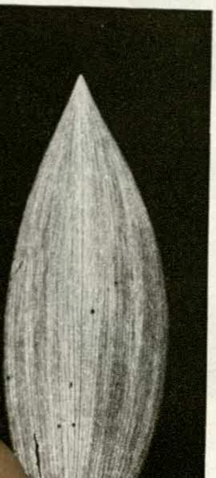
Leaf veins form patterns which help us identify leaves. There are three principal types of leaf-vein patterns.

PINNATE shaped like a feather



Elm

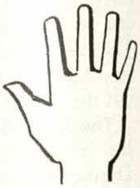
PARALLEL



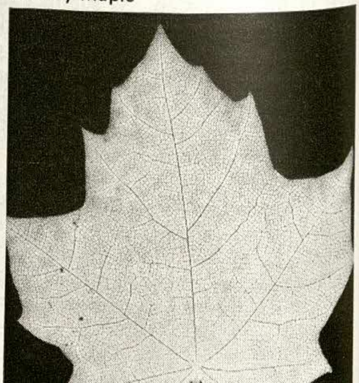
Lily of the Valley

Frank Fenner; Parsons, Black Star

PALMATE like a hand



Norway Maple



Nasturtium leaf is a sort of "wheel" with its axle near the center. Some leaves are almost too fancy to describe. These include the thready leaves of *yarrow* (a weed that grows in the field), *grapevine* leaves that make many fancy patterns, and the beautiful lacy leaves of *ferns*. Some leaves are so "lopsided" they look funny. You can find lopsided leaves on *elm*, *linden*, and *witch hazel*.

The edges of leaves sometimes are as smooth as a clean line drawn with a steady hand. Other leaf edges are wavy or scalloped. Many leaf edges have "teeth," or sharp points. The teeth of *cherry* and *birch* leaves are small and close together like the teeth of a saw. The *elm* leaf has big double teeth.

You will never find two oak leaves exactly the same shape. But they have some things in common. The leaves of one family of oaks, the white oaks, are smooth around their edges and waves and fingers. The leaves of the black oaks have a hair or bristle on the tip of each leaf finger, and sharp slits between the fingers.

Many plants have plain oval leaves lying flat on the ground and fancy leaves farther up on the stem. If you look closely at leaves of weeds and field plants and vegetables, you will often see different shapes growing on the same plant. In the woods where *sassafras* grows, you can find three entirely different shapes of leaves on one sassafras bush. Some are plain oval, some are oval with one finger thrust out so that the leaf looks like a mitten, and some have two fingers, one on each side. But in general they are all oval in shape. The leaves on a *mulberry* tree also have different shapes, from plain hearts to fancy indented leaves.

OLIVE LEAVES ARE FOR PEACE

Noah knew the Flood was over when a dove brought him an olive branch. Olive leaves have long symbolized peace and hope.

Univ. of California

Leaves with Interesting Veins. You can see another kind of beauty in leaves if you look for the network of their veins. You can turn a leaf underside up, cover it with tissue paper, rub a pencil over it, and get a vein pattern in the same way you can get a picture of a coin.

THE LAUREL LEAF IS A SYMBOL OF VICTORY

A person who has "won his laurels" has gained success. The ancient Greeks awarded laurel crowns to winners of the Pythian Games, and to certain public officials.

L. W. Brownell

Autumn Leaves. In autumn, brightly colored leaves fall from trees and bushes. Under maple, elm, or birch trees there is a deep carpet of leaves. One way to make an interesting fall leaf collection is to arrange many maple leaves in order, showing their range of colors from green through light lemon yellow, orange, and bright red. Maples have more different colors in their autumn leaves than any other trees. Other leaves usually turn to one color. For example, dogwood, blackgum, sumac, and scarlet-oak leaves turn a rich red. Poplar and birch leaves are lemon yellow. Ash leaves turn prune purple in the fall.

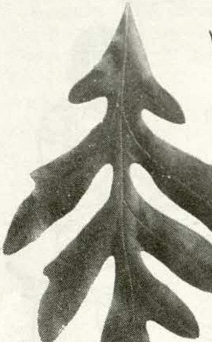
Weed Leaves. You can make an unusual leaf collection from the weeds of a garden, lawn, or field. You do not have to be careful about picking weed leaves. You can even take the entire plant if you wish. A collection of weed leaves might be even more unusual and have more variety than a collection of tree leaves.

Leafy Branches for Decoration. Leaves on branches should be collected only for special occasions, such as Thanksgiving, Christmas, or Easter decoration, or for fall color decorations. Never take branches from park or roadside trees. If you need some leafy branches, the best place to get them is in a thicket of shrubs or young tree shoots which needs to be thinned out.

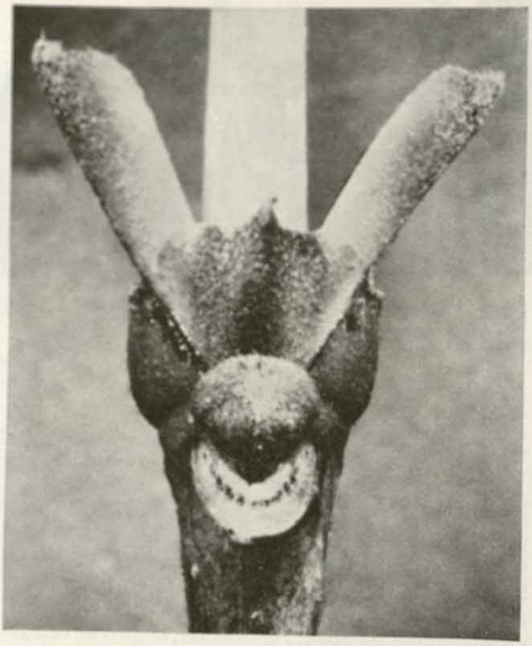
When leafy branches are cut, their fresh green leaves usually shrivel up, turn brown, and fall off within a day. To keep the leaves green, cut the twig cleanly with a knife or scissors. Do not tear it off. Then put

OAK LEAVES STAND FOR STRENGTH, GLORY, AND HONOR

The Romans decorated their war heroes with crowns of oak leaves.



U. S. Forest Service



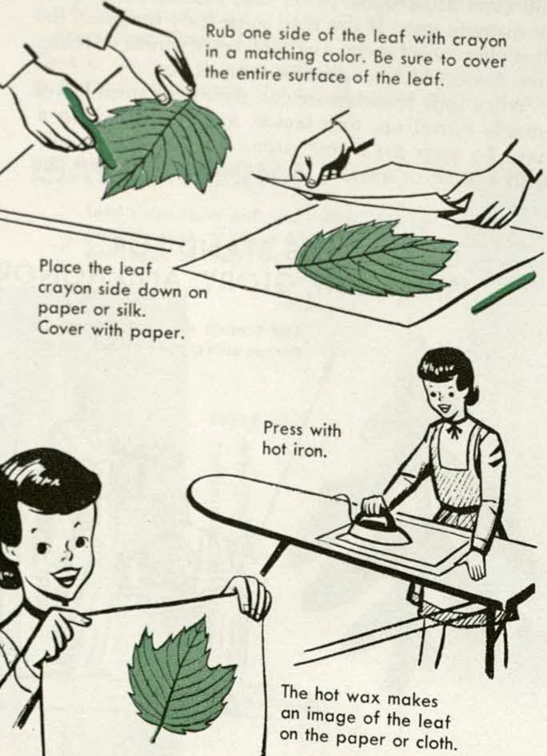
Rutherford Platt

This "Monster" Won't Bite. Its "ears" are the opening buds of ash leaves, and its "teeth" are the leaf scars of last year's leaf. There are many other odd faces to be found in leaf scars.

the branch into water like cut flowers as soon as possible. Oak or beech tree branches are good to collect because their leaves do not fall off so quickly as those of most other trees.

One special time for collecting live branches is in early spring just before the leaves come out of their buds. A twig with buds on it will unfold its feathery, light-green little leaves within a week if it is kept in water.

HOW TO MAKE A LEAF TRANSFER



Rub one side of the leaf with crayon in a matching color. Be sure to cover the entire surface of the leaf.

Place the leaf crayon side down on paper or silk. Cover with paper.

Press with hot iron.

The hot wax makes an image of the leaf on the paper or cloth.

Seeing "Faces" in Leaf Scars

When a broad leaf drops off in autumn, the wide base of its stem leaves an odd mark on the twig. This mark is called the *leaf scar*. You can see leaf scars best in winter. Look for them on the wood of the twig just below a bud. You may suddenly see a scar that looks like a tiny face staring at you. You can see many of these "faces" with the naked eye. But if you use a magnifying glass, leaf-scar faces are even more showy and astonishing. Some of the funniest faces are those on hickory or butternut trees. These leaf scars may look like faces of camels, horses, or monkeys. The oval faces under an elm bud may look sleepy or seem to be winking at you. Trembling aspen has a heart-shaped face with round eyes and a flattened nose. You will find many leaf-scar faces on the woody twigs of trees and bushes—and they all have different expressions.

RUTHERFORD PLATT

Related Articles in WORLD BOOK include:

Bud
Chlorophyll
Photosynthesis
Plant (Leaves)
Transpiration
Tree

Outline

I. Kinds of Leaves
  A. Leaves of Broad-Leaf Trees
  B. Leaves of Grass
  C. Needle Leaves
  D. Leaves That Protect the Plant
  E. Bracts
  F. Leaves That Keep the Plant Warm
  G. Leaves That Stick and Scratch
  H. Leaves That Catch Animals
  I. The Biggest Leaves
  J. The Smallest Leaves
II. The Parts of a Leaf
  A. The Blade
  B. The Stem, or Petiole
  C. The Stipules
III. The Leaf as a Food Factory
  A. Inside a Leaf
  B. "Magic" Chlorophyll
  C. Leaves That Grow in Dim Light
  D. Plants That Have No Chlorophyll
IV. The Life Story of a Leaf
  A. How the Leaf Begins in the Bud
  B. The Fully Grown Leaf
  C. Why the Leaf Turns Color in Autumn
  D. How the Leaf Helps Make New Life
V. How To Collect Leaves
  A. Gathering Green Leaves
  B. Preserving Green Leaves
  C. Finding Leaves with Beautiful Shapes
  D. Leaves with Interesting Veins
  E. Autumn Leaves
  F. Weed Leaves
  G. Leafy Branches for Decoration
VI. Seeing "Faces" in Leaf Scars

Questions

Why do leaves change color in autumn?

What is the most important value of leaves to man?

How much water may a large elm tree give off in one day? Where does this water come from?

What materials do plants use in the manufacture of food? What is this food-making process called?

About how many leaves may it take to manufacture the food in a medium-sized apple?

What plant has red leaf bracts that are often mistaken for flower petals?

What is each of these: (1) petiole, (2) stipule, (3) blade?

LEAF, MUNRO (1905-   ), is an American author and illustrator of children's books. Among his best-known works is *The Story of Ferdinand* (1936), the tale of a bull who would not fight. Both children and adults enjoy the story for its amusing and satirical commentary.

Leaf also wrote *Manners Can Be Fun* (1936), *Wee Gillis* (1938), *Safety Can Be Fun* (1938), *Arithmetic Can Be Fun* (1949), *History Can Be Fun* (1950), and *Geography Can Be Fun* (1951). He was born in Hamilton, Md., and attended the University of Maryland. GEORGE E. BUTLER

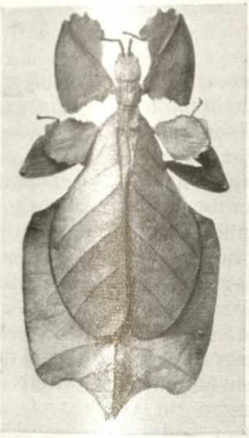
See also LAWSON, ROBERT (picture).

LEAF CURL. See PEACH (Diseases).

LEAF CUTTER. See ANT (Leafcutter; Helpers and Pests); BEE (Kinds).

LEAF INSECT is an insect that looks much like a green leaf or a twig. It is sometimes called a *walking leaf* because of this similarity. It is found in Africa, southeastern Asia, northern Australia, and in the many islands of the South Pacific. Several species called *walking sticks* live in America.

The best-known leaf insect is an East Indian species. It is bright green in color and grows about 3 inches long. It looks much like a leaf because of its broad ribbed wings which fold over its back in the shape of a leaf. It also has leaflike growths on the joints of the legs. The eggs look much like the seeds of plants. Leaf insects live among the leaves of trees and shrubs, where they are hard to find because of their shape and color. They feed on the leaves at night, and usually stay quiet during the day.

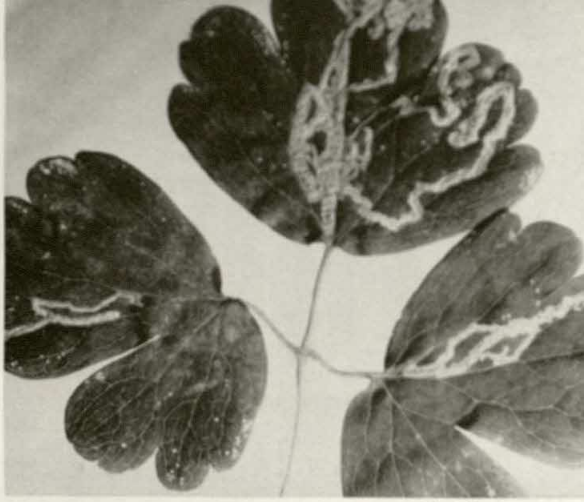


USDA

A Leaf Insect of the Philippines is more than 3 inches long. Its greenish color helps the insect hide among the leaves.

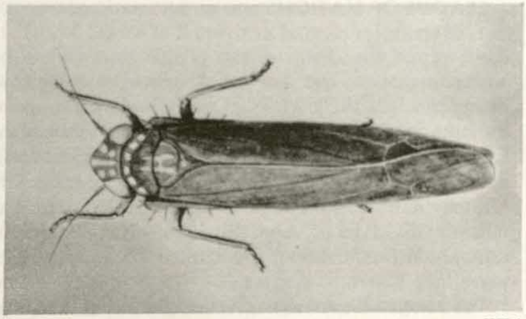
Scientific Classification. The East Indian leaf insect belongs to the family *Phasmidae*. Some scientists classify leaf insects in the order *Orthoptera*. Others put them in a separate order, the *Phasmida*. CARL D. DUNCAN

See also WALKING STICK.



Hugh Spencer

Larvae of the Leaf-Miner Insect have eaten away the green tissue inside these wild columbine leaves, leaving white tunnels.



USDA

The Apple Leafhopper spreads fire blight in apple orchards, and also feeds on potatoes and other crops.

LEAF MINER is a tiny fly, moth, or beetle which, in the larval stage, lives between the upper and lower skins of leaves. Leaf miners eat the inside of the leaf, leaving white winding tunnels or broad whitish blotches. The larvae of some species mine under the skin of fruits, stems, or branches of shrubs and trees. They can be highly destructive.

The lives of leaf miners begin when the female insects lay small eggs on the undersides of plant leaves. From the eggs are hatched larvae that begin to eat tunnels, or mines, in the leaf. There may be one or more larvae in a leaf, and some migrate from leaf to leaf. They may become full grown in one to three weeks, and then they enter the pupal stage of their lives (see INSECT [Life Histories]). Some drop to the ground and make cocoons. Others stay on or inside the leaf until they develop into adult insects. Three or four generations may appear in a season. Leaf miners may be found throughout the world, and there are many species. See also LARVA.

LEAF ROLLER. See MOTH (Kinds of Moths).

LEAFHOPPER is one of a large group of insects that feed on plants. These insects are found throughout the world. All species have piercing-sucking mouth parts. They rob plants of their juices, causing them to dry up and wilt. They have a habit of running sideways, and the winged species fly easily. Many leafhoppers carry plant virus and bacterial and fungus diseases.

The leafhopper has a small, slender body of many colors. It is usually only one twentieth to one fourth of an inch in length.

Scientific Classification. Leafhoppers belong to the families *Cicadellidae* and *Jassidae*. An important North American type is the beet leafhopper, genus *Eutettix*, species *tenellus*.

LEAGUE, *leeg*, is a measure of length. One league equals 3 geographical miles of 6,076.10333 feet, or 3.452 statute miles of 5,280 feet. Today, the word *league* is sometimes used on the ocean by British and American seamen. The league has been used since ancient times. The Gauls made it equal to 1,500 Roman paces, or what would be 1.376 modern English miles. The Normans brought the league to England. At that time it equaled 2 English miles, or 2.9 modern statute miles. See also MILE. E. G. STRAUS

United Press Int.

The Palace of Nations stands in Ariana Park, Geneva, Switzerland. The building is located on the edge of the city, overlooking beautiful Lake Geneva. It is two blocks wide and a block long. The huge structure was completed in 1937 at a cost of $5,000,000, donated by the American, John D. Rockefeller, Jr. Various United Nations agencies have held their annual sessions in the Palace. In 1954, the Geneva Conference on Far Eastern Affairs met here.

LEAGUE OF NATIONS was an international association of countries created at the end of World War I. It grew out of the desire of the people throughout the world to prevent war forever. The League came into being Jan. 10, 1920. Most of the important European nations were members. Although Woodrow Wilson, then President of the United States, is generally looked upon as the founder of the League, he could not persuade the United States to join it. The League of Nations was officially dissolved on April 18, 1946, when another international organization, the United Nations, took its place. See UNITED NATIONS.

The League Covenant. The League of Nations was organized under the League Covenant, or constitution. This document contained 26 articles explaining the organization and purpose of the League. The Covenant created three main bodies—the Secretariat, the Assembly, and the Council.

The Secretariat was the permanent secretarial staff of the League. It consisted of several hundred persons of all nationalities appointed by the League Council. The Secretariat appointed persons to work in the different League sections. Some of the important sections were Political, Economic and Financial, Communications and Transit, Disarmament, and Health.

The Assembly was the largest and most democratic body of the League. Each of the member nations sent representatives to the Assembly. These representatives had only one vote no matter how large the country they represented. The Assembly was often called "the sounding board of the civilized world." During its sessions, which were held at least once a year, the words of speakers were carried by newspapers throughout most of the civilized world. The Assembly admitted new members, elected temporary members to the Council of the League, controlled the budget, and made changes in the League Covenant.

The Council. The most important work of the League of Nations was the peaceful settlement of international quarrels. The Council was set up for this purpose. Originally, there were to be nine members, but the number was later increased to 14. Great Britain and France, and

MEMBERS OF THE LEAGUE OF NATIONS

Original members, signers of the Treaty of Versailles, are marked with asterisks (*). Notices of withdrawal were effective after two years.

Afghanistan (entered 1934)
Albania (entered 1920; annexed by Italy, 1939)
Argentina*
Australia*
Austria (entered 1920; annexed by Germany, 1938)
Belgium*
Bolivia*
Brazil* (withdrew 1926)
Bulgaria (entered 1920)
Canada*
Chile* (withdrew 1938)
China*
Colombia*
Costa Rica (entered 1920; withdrew 1925)
Cuba*
Czechoslovakia*
Denmark*
Dominican Republic (entered 1924)
Ecuador (entered 1934)
Egypt (entered 1937)
El Salvador* (withdrew 1937)
Estonia (entered 1921)
Ethiopia (entered 1923)
Finland (entered 1920)
France*
Germany (entered 1926; withdrew 1933)
Great Britain*
Greece*
Guatemala* (withdrew 1936)
Haiti* (withdrew 1942)
Honduras* (withdrew 1936)
Hungary (entered 1922; withdrew 1939)
India*
Iran (Persia)*
Iraq (entered 1932)
Ireland (entered 1923)
Italy* (withdrew 1937)
Japan* (withdrew 1933)
Latvia (entered 1921)
Liberia*
Lithuania (entered 1921)
Luxembourg (entered 1920)
Mexico (entered 1931)
Netherlands*
New Zealand*
Nicaragua* (withdrew 1936)
Norway*
Panama*
Paraguay* (withdrew 1935)
Peru* (withdrew 1939)
Poland*
Portugal*
Romania* (withdrew 1940)
Russia (entered 1934; Council ended membership, 1939)
South Africa*
Spain* (withdrew 1939)
Sweden*
Switzerland*
Thailand (Siam)*
Turkey (entered 1932)
Uruguay*
Venezuela* (withdrew 1938)
Yugoslavia*

for a time Italy, Japan, Germany, and Russia, held permanent seats on the Council. The remaining seats went to the other League members in turn. The Council members met at least once every four months to consider serious threats to world peace.

One of their most difficult tasks was to keep small nations from being unjustly attacked by more powerful neighbors. When this happened, the quarreling members could be called before the Council and asked to submit arguments for their case. The Council then tried to settle the dispute satisfactorily and peacefully.

Any member nation of the League which felt itself threatened by one or more nations could bring its complaint before the Council. Each of the quarreling nations would present its side of the dispute. After hearing all arguments, the Council members would try to reach a decision that would please all sides. In this manner, the Council successfully settled a boundary dispute between Greece and Bulgaria in 1925.

Unfortunately, the efforts of the Council were not always successful. For example, during 1935 and 1936 the Council failed to settle the dispute between Italy and Ethiopia. At that time, Italy was trying to build up a great empire at the expense of the Ethiopians. Italian troops were sent into Ethiopia and they overpowered the weak defenders. The Emperor of Ethiopia appealed to the League and the case came up before the Council.

The failure of the Council to solve the Italian-Ethiopian dispute did much to weaken and finally destroy the influence of the League of Nations. No one really had the power to force nations to remain at peace. Settlement of disputes involving large nations depended on the sincere desire of all nations to solve problems honestly. Too many nations refused to cooperate. This was one of the big reasons why the League of Nations failed to keep peace in the world. PAYSON S. WILD, JR.

See also INTERNATIONAL RELATIONS; INTERNATIONAL COURT OF JUSTICE; WILSON, WOODROW; WORLD WAR I (Peace Aims); WORLD WAR II (Problems Left by World War I).

LEAGUE OF WOMEN VOTERS is a nonpartisan women's organization for political action. The league was founded in 1920, when women in every state received the right to vote. The league's program is based on the idea that political education is a necessary part of democratic government. The broad purpose of the league is to create a sense of responsibility for government in as many American citizens as possible. The organization also tries to influence lawmaking and law administration for the benefit of the public.

Organization. The League of Women Voters has groups throughout the United States, totaling about 1,000 local leagues. Any woman who believes in the league's program may become a member of the league in her own community. At the same time she also becomes a member of the state and national organizations.

The league decides on its program in national conventions held every two years. The local and state leagues study proposed programs and make suggestions for the national program. The activities of the state and local leagues are limited and directed by decisions made at the national conventions.

Program. The league works to promote world peace, national prosperity, education, and social welfare. It is interested in providing accurate information on vital public issues. The league does not take political sides, and does not endorse or oppose candidates for public office. But the organization studies the views and qualifications of officeholders and candidates for office. It makes these views and qualifications known to the public. League members also try to influence the action of their lawmaking representatives.

The league tries to assure good administration of existing laws, as well as to promote good new laws. Its members keep in close touch with the local governments in their communities. Local league activities include campaigns for better forms of city and county government, and for better school systems. The members also visit city councils, school boards, and state legislatures, and work before elections to give the voters information and to get them to vote. Local leagues hold discussion groups on many public issues and strive to give information to citizens and to interest them in their government.

The League of Women Voters was organized in 1920 as an outgrowth of the National American Woman Suffrage Association. It has national headquarters at 1026 17th St. N.W., Washington 6, D.C. The national organization publishes a Washington newsletter called *The National Voter*. It also distributes special bulletins on important national issues. MARY ANN GUYOL

See also CATT, CARRIE CHAPMAN; WOMAN SUFFRAGE.

LEAH. See JACOB.

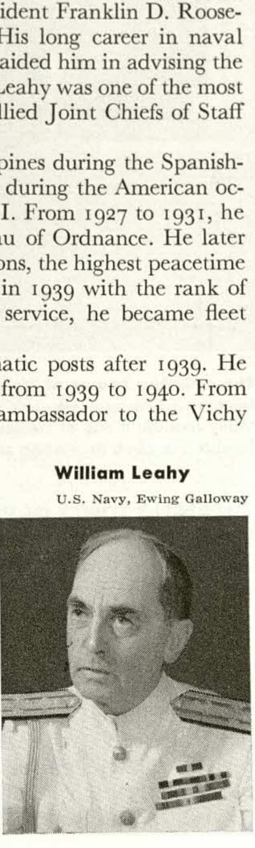
LEAHY, *LAY he,* **WILLIAM DANIEL** (1875-1959), served as chief of staff to President Franklin D. Roosevelt during World War II. His long career in naval affairs and diplomacy greatly aided him in advising the President on military affairs. Leahy was one of the most influential members of the Allied Joint Chiefs of Staff during the war.

Leahy served in the Philippines during the Spanish-American War, in Nicaragua during the American occupation, and in World War I. From 1927 to 1931, he was chief of the Navy Bureau of Ordnance. He later became chief of naval operations, the highest peacetime post in the navy. He retired in 1939 with the rank of admiral. After his return to service, he became fleet admiral in 1944.

Leahy held several diplomatic posts after 1939. He was governor of Puerto Rico from 1939 to 1940. From 1940 to 1942, he served as ambassador to the Vichy government of France. Leahy became chief of staff to the President in 1942. Upon retiring from this post in 1949, he wrote his autobiography, *I Was There* (1950). It is one of the best sources for behind-the-scenes diplomatic and military history of World War II and the period after the war. Leahy was born in Hampton, Iowa, on May 6, 1875. DONALD W. MITCHELL

William Leahy

U.S. Navy, Ewing Galloway



LEANDER. See HERO AND LEANDER.

H. Armstrong Roberts

The Leaning Tower of Pisa has been one of the world's most famous architectural wonders since it was completed in 1350. Many consider it one of the seven wonders of the modern world. Tourists can climb its winding stairs for a view of Pisa.

LEANING TOWER OF PISA is a famous bell tower at Pisa, Italy. It is often considered one of the seven wonders of the modern world. The tower tips so far to one side that it looks as though it will fall. But it has stood for hundreds of years. It was begun in 1174 and completed in 1350. The ground beneath the tower started to sink after the first three stories were built. The tower began to lean, and continued leaning until it was $16\frac{1}{2}$ feet out of line. It has tipped one foot during the last hundred years. In 1928, the Italian government started to give the tower a firm foundation. Cement was forced into the soil beneath the tower to prevent further leaning.

It is said that Galileo made his famous experiments with falling weights in 1589 from the top of the tower. But many scholars no longer believe this story.

The tower, or *campanile*, built entirely of marble, is a fine example of Romanesque architecture. The tower, the cathedral, and the baptistery form one of the most famous building groups in the world.

The leaning tower is 179 feet tall. The walls are 13 feet thick at the base and between 6 and 7 feet thick at the top. A row of arches, resting on 15 columns, surrounds the first story. Each of the next 6 stories is surrounded by 30 columns. The top story has 12 columns. This top story houses the bells. An inner staircase of nearly 300 steps leads to the top, which offers a fine view of the surrounding country. G. Holmes Perkins

LEAP YEAR has 366 days, or one more day than an ordinary year. A leap year occurs in every year which can be divided evenly by four, except the years that mark the even hundreds, as 1500. The only century years that are leap years are those that can be divided evenly by 400, such as 1600 and 2000. Leap years were added to the calendar to make the calendar year nearly the same as the solar year, which is the length of time required for the earth to circle the sun completely. The extra day is added to the end of February and occurs as February 29 once every four years. Paul Sollenberger

See also Year.

LEAR, EDWARD (1812-1888), an English painter and writer, became famous for his nonsense verse and landscape paintings. He illustrated much of his verse with drawings as delightful and absurd as his verse. Lear began his career by painting birds and animals. His books include *A Book of Nonsense* (1846), *Nonsense Songs, Stories, Botany and Alphabets* (1871), and *Laughable Lyrics* (1877). "The Owl and the Pussy-Cat" (1871) became a minor classic. Lear was born in London. C. L. Cline

LEAR, KING. See Shakespeare, William (Synopses).

LEARNING is the process by which a person may gain new skills or new knowledge. It is easy to identify what we have learned when we learn how to ride a bicycle or how to say "good morning" in a foreign language. But we also learn other things. We learn our *preferences*, or likes, such as learning to eat olives. Or, we learn our *prejudices*, or strong dislikes, as when we accept one political party as always wiser than another. We also learn the mannerisms and gestures that distinguish us from other persons, such as special facial expressions or special ways of talking. We also may learn undesirable habits, such as biting our nails. Thus, within learning, we include all our acquired ways of behavior (see Behavior).

How We Learn

Skill Learning. Much learning requires the combination of many smaller patterns of movement into larger units, controlled by various signals that reach us through our senses. For example, operating a typewriter requires putting together many skilled finger movements controlled by the letters and words that we want to copy. This kind of learning requires repeated practice to smooth out the rough spots. Because of this, psychologists often call it trial-and-error learning.

As a result of their research, psychologists have developed a few general rules designed to help a person learn skills. One rule is that a person usually learns skills more easily with a few short, widely spaced practice sessions than with longer sessions held closer together. Another general rule says that for acts that require a high degree of skill, an expert instructor is often helpful to show the learner what a good performance is like, to diagnose and correct errors, and to prevent the learning of habits that interfere with performance of the skill. Thus, psychologists would recommend the help of a golf professional when learning to play golf, or the help of a typing instructor when learning to type.

Memorization. Psychological research has also developed some general aids to memorization, or "learning something by heart." These aids will help you learn such things as the lines of a play or the notes of a selection for the piano. Generally, psychologists suggest that you try to learn from beginning to end. That is, if you want to memorize a poem, do not learn it stanza by stanza, but try to memorize the entire poem as a unit. You can select difficult parts for special study, but generally try to take a "running start" so that you do not forget the transitions from one section to the next. Also, you can learn more easily material that you understand and that has meaning to you. Another aid to learning is immediate *recall* of material. For example, if you are trying to learn material in a book, you should keep the book closed much of the time and try to recall what you have just read. If you want to remember something for a long time, recalls spaced at increasing intervals help delay the forgetting process. See MEMORY.

Readiness to Learn. Learning takes place more efficiently when a person is ready to learn. Readiness comes about through the combination of at least three processes. These are (1) growth, (2) prior experience, and (3) desire to learn. An example of these processes is readiness to learn to read. A child cannot learn to read easily until he is old enough, until he has a sufficient background of spoken words and prereading experiences with letters and pictures, and until he wants to learn to read. See READING.

Motivation in Learning. Psychologists and educators generally recognize that learning takes place best when the learner is motivated to learn. Thus, teachers have the important job of arousing interest in pupils in what is being taught, and giving pupils a desire to learn. See MOTIVATION.

Motivation is also important in training animals. For example, animal trainers use food as a reward when teaching animals tricks. To increase motivation, the trainers allow the animals to become hungry. The animals then have a greater interest in their food, and it becomes more effective as a reward and an aid to learning.

In human learning, rewards tend to be social, such as praise when a person learns something well. Of course, punishment is also used to control learning, particularly the threat of punishment from which the learner tries to escape. But careful experiments have shown that reward serves as a more effective aid to learning than punishment. This is due largely to two factors. First of all, a learner can recognize the direct effects of a reward more easily than he can the effects of punishment. Also, the by-products of a reward are more favorable. For example, reward leads to liking the rewarded task, while punishment leads to dislike of the punished deed.

Psychologists also look at the motivation of learning from the point of view of the learner. Then they tend to talk about success and failure, rather than reward and punishment. *Success* consists of reaching a goal that the learner sets for himself. *Failure* consists of not reaching the goal. An ideal learning situation is one in which the learner sets for himself progressively more difficult goals, and keeps at the task until he succeeds.

Formal Discipline and Transfer of Training. An old point of view toward learning assumed that learning something difficult improved the mind. This led to the doctrine of *formal discipline*, according to which the mind was best trained by studying classical languages and mathematics. Psychologists and educators no longer support this position, although they do recognize that new learning profits from old learning, which they call *transfer of training*. Scholars believe that transfer of training results not from training the mind, but from acquiring good study habits, through similarities between old and new problems, and through the application of ideas and understandings from earlier learning.

Theories of Learning

Psychologists cannot exactly explain what takes place when we learn. They hope someday to understand what happens in the brain during the learning process. However, scientists have proposed two main theories about how learning takes place. One theory states that all learning is the formation of habits of greater or lesser complexity. The second theory, called *sign learning* or *cognitive theory*, stresses the act of knowing (cognition) above the importance of habit. ERNEST R. HILGARD

Related Articles in WORLD BOOK include:

Animal (Learning Ability of Animals)
Apperception
Association, Law of
Education (The Educative Process)
Habit
Intelligence
Memory

LEASE, *leese*, is a contract between a person who owns land or other property and a person who rents it from him. The person who grants the lease is called the *lessor*. The person to whom the lease is granted is called the *lessee*, or *tenant*. The compensation which the tenant agrees to pay the lessor is called the *rent*.

A lease for life ends when the tenant dies. A lease for a term of years begins and ends at dates set in the lease. The lease does not end when the tenant or lessor dies, but is binding on the heirs of both parties. Some leases are for a long period, such as 99 years. Such leases usually give the lessee greater privileges than those granted a short-term tenant.

Rents are generally paid in money, although occasionally they are paid in goods. For example, a man who rents a farm may agree to pay his landlord a certain part of his crops as rent.

A lease must include certain items of information to be a legal contract. These include the names of the lessor and tenant, the dates of the beginning and end of the lease, the amount of rent, a complete description of the property, and a complete statement of the rights and duties of each party. Most state laws provide that leases that cover a period of less than a year need not be written, but leases for a longer period must be in writing. Sometimes leases are prepared by the lessor's lawyer and the lessee's lawyer. WILLIAM TUCKER DEAN

See also CONTRACT; FIXTURE; RENT; TENANT.

Hedrich-Blessing

A Leather Cutter in a shoe factory uses a sharp-edged form to cut pieces into the proper shape for the upper part of shoes.

LEATHER, *LEHTH ur.* Man has known for thousands of years how to dress the skins of animals to preserve them and make them soft and flexible. The early cave men soon discovered that the skins of the animals they killed could be preserved and made into foot coverings and clothing. The Egyptians made leather so well that specimens more than 3,000 years old have been found almost perfectly preserved.

The Indians of North America made leather from deerskin. They piled their skins in packs so that the tissue surrounding the hair rotted off. They scraped the flesh from the inner side of the skin by hand. The Indians tanned this leather by pounding oil and brains of animals into the skin. They completed their deerskin leather by smoking it. The leather was soft and remarkably good. They called it *buckskin*.

All animals' hides and skins can be tanned. Cattle hides are by far the most important raw material for tanners. But the skins of calves, sheep, hogs, and goats are also tanned on a large scale. Other types of leather are provided by the skins of sharks, and such reptiles as snakes, alligators, and lizards.

Today, leather is chiefly important for its use in shoes. The shoe trade uses about 80 per cent of the total production of the leather industry of the United States. But leather is exceedingly important for other uses, such as industrial belting for power transmissions, harnesses and saddles, gloves, jackets, and other clothing, luggage, upholstery, and sports equipment.

The United States is the leading producer of leather. The value of the leather produced in the country totals about $1,637,417,000 a year. The states leading in leather manufacture are Massachusetts, New York, Missouri, and Pennsylvania.

No set rule exists by which hides and skins must be processed into leather. A process that may be satisfactory in one plant may prove entirely out of line in another. In both cases a very desirable product may be manufactured. This article describes typical processes.

Preparing Raw Leather

Soaking. The skins and hides are received at the tannery in a *cured* form, which means that they have been treated to prevent rotting. The hides and skins are immediately soaked in water to soften them and to remove any substance which has been used as a curing or preserving agent. The soaking period varies from 2 to 48 hours, depending on the condition of the hide. After the soaking operation, the hide is washed with water to remove any of the curing agent, dirt, or other foreign matter that may stick to it. This operation takes place in vats called *pits*, or *paddle vats*.

Fleshing. Machines equipped with a rubber roller and a shaft to which spiral knives are attached remove the flesh and tissues from the inner side of the skin. These knives leave a clean, uniform surface.

Unhairing. After fleshing, workers transfer the skin to a department called the *beam house*, where it is treated to remove the hair. The hides are soaked in a vat containing a solution of lime, a large amount of undissolved lime, and a small amount of sodium sulfide. The hides remain in the lime solution from three to seven days, and are moved about, or *milled*, each day. At the end of this period a machine easily removes the hair by scraping it off with a series of blunt blades.

The action of the lime swells the hide considerably. The flesh side of the hide becomes rough, because of the swelling particles of tissue which were not removed in the first fleshing operation. It is necessary, therefore, to *reflesh* after the hair is removed. After the second fleshing operation, the hides and skins are *scudded*. This operation removes the last bit of skin and hair roots which were not removed by the unhairing machine. A hand worker called a *beamster* usually performs the scudding. He uses a moon-shaped knife on a table which forms an arc and is set at an angle of about 45°. One end of this table rests on the floor, and the other end is waist high to the beamster.

Bating. The next operation involves removing the lime from the skins and hides. Washing with cold water does part of this. After washing, the skins and hides are placed in a paddle vat filled with warm water, to which a *bating* material is added. The bating, which removes nearly all the lime, usually consists of an enzyme and a lime neutralizing agent such as ammonium sulfate or chloride. Finely divided pancreas provides most of the enzyme.

The bating operation not only removes lime, but the action of the enzyme also changes the physical condition of the hide or skin, making it soft and giving the grain a silky feel. The way this is done will be reflected in the grain of the finished leather. Bating may require 30 minutes to 4 hours. When the operation is completed, the hides are washed with cold water, removed from the vats, and piled flat to drain.

At this stage of leather manufacture, the hides enter into either vegetable-tanning or mineral-tanning classifications, depending upon the future use of the leather.

Vegetable Tanning

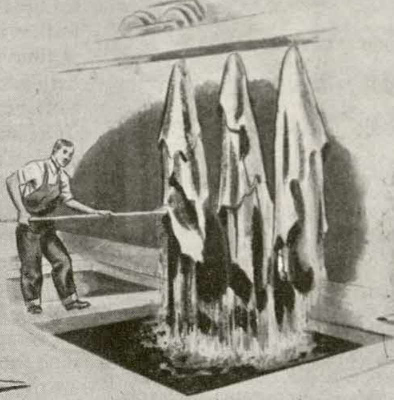
Leather for shoe soles, bags, cases, straps, harnesses, upholstery, and lining and belting leather is prepared by vegetable-tanning.

All vegetation contains a bitter ingredient called *tannin*. It has the property of combining with proteins to form a compound that will not rot easily. In this instance, the protein is the hide or skin, and the resulting com-

HOW LEATHER IS MADE

BEFORE TANNING

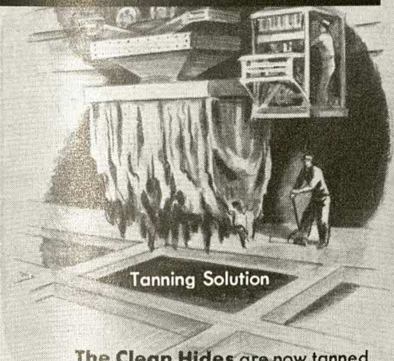
Hides Are Salted or Dried to preserve them until they are tanned.



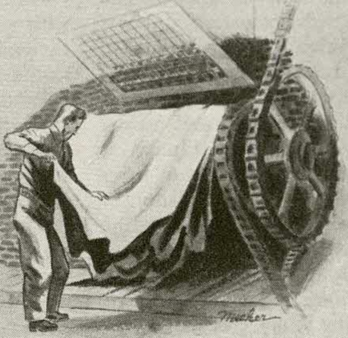
Hair Is Removed from the hide by soaking it in a lime solution and rubbing the hair off by machinery.

All Remaining Hair, and the Flesh on the inside of the skin is scraped of with a large dull knife.

TANNING



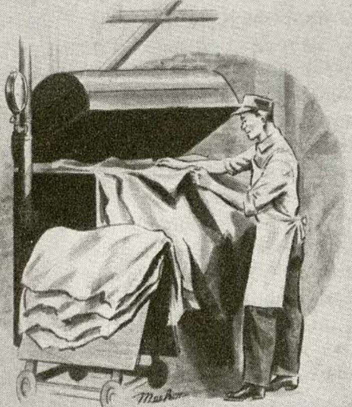
The Clean Hides are now tanned in vats of chemicals that change the animal skins into leather.

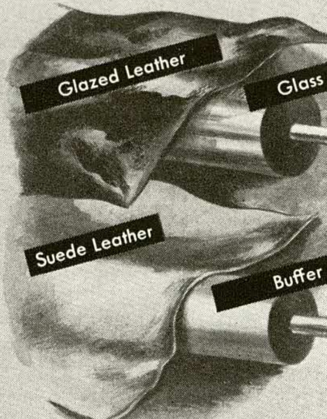


The Tanned Hides are run through a wringer to squeeze out the chemicals, and hung on racks to dry.

Oils Are Applied to the leathers to make them strong and soft.

FINISHING

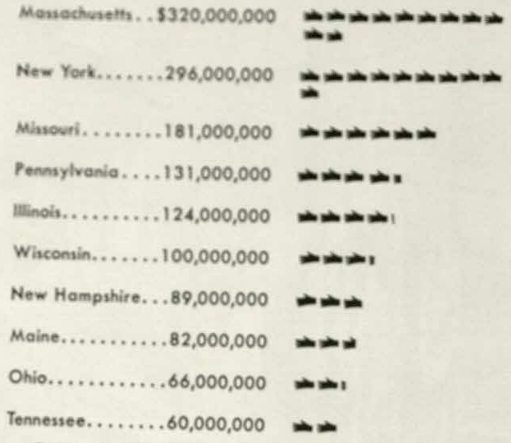




Boarding Leather gives it an at-

Embossing Machines press designs on the leather and bring out its grain.

Suede Leather is made by buffing. Glass is used to give leather a glaze.



TEN LEADING LEATHER STATES

Each symbol stands for $30,000,000 of value added by manufacturing.

Based on government statistics for a 4-year period.

pound is leather. See TANNIC ACID.

The principal sources of tannin for leather are the leaves, nuts, bark, and woods of hemlock, oak, chestnut, sumac, quebracho, mangrove, divi-divi, and wattle; the extract cutch; and the fruit myrobalan. The tannin is extracted from them with hot water.

Sole Leather is tanned by a mixture of several tannins. After the tannins are mixed, they are diluted. The tannin solutions are run into vats equipped with cradles or rockers to which the hides are attached, and a slow rocking motion is obtained. The tanning solution at first is made very weak, containing from 0.5 to 1 per cent of tannin. Later the vats are filled with stronger solutions. Over a section, or *battery*, of 15 to 30 vats, the solution, or *liquor*, may contain from 1 to 4 per cent tannin. It may take 15 to 30 days before a hide passes through all the rocker section, beginning with the weaker solution and progressing to the stronger one. At the end of this period the hides are usually *struck through*, which means that the tannin has soaked through the entire cross section of the skin.

But the hides are not thoroughly tanned at this stage. They are placed in still stronger tannin liquors from 15 to 100 days longer. During this period the tannin liquors are strengthened at intervals to make up for the tannin that soaks into the hide.

The first tanning liquors into which the hides are placed are commonly known as *rockers* or *handlers*. The last liquors are *layaways*. After the hides are taken out of the layaways, they are thoroughly cleaned with water to remove all foreign substances. They are then placed in a tanning drum and mixed with concentrated tanning extract to increase the durability of the finished leather. Then follows a *tempering* in which the hides remain in a warm, strong tanning liquor for three to five days. After removal from the tempering vats, the hides and skins are piled flat to drain overnight, then put through a wringer to remove all liquid.

The hides are *set*, or put through a machine which presses out the wrinkles and in general smooths the leather to a uniform evenness. The leather is then bleached by being dipped first in a weak alkaline solution, then in water, then in a weak acid solution, and finally in water again. The hides are put through the wringer again, after which they are *stuffed*.

In stuffing, the leather is placed in a large rotating drum, which is heated either with hot air or steam. Hot oils and greases are added as the drum moves. The leather is dried and the stuffing operation repeated. The leather is rough and wrinkled as it emerges from the stuffing process. It is then piled for 5 to 10 days to flatten, or *crust*.

The crusted leather is then *mulled* by being dipped in water and hung in a compartment saturated with moisture. After three or four days, the leather is damp and quite flexible, and an emulsion of soap, oil, and wax is applied to the grained surface. The leather is then rolled to compress the fibers and smooth the grained surface, and hung to dry in a hot room or tunnel. When dry, the grained surface is polished to a high gloss.

Bag, Case, Harness, and Strap Leather is treated in the same way as sole leather, except that the total tanning time is much shorter. Different mixtures of tannin are used. But after the leather is crusted, it is finished in a decidedly different manner.

Bag, case, and strap leather is split to the desired thickness. The splits are used for various purposes, including low-priced luggage, belts, the insoles of shoes, and other articles where a light, thin leather is desired.

Harness leather is taken out of the crust and stuffed with a high percentage of oils and greases. After this the grain is finished and polished by hand. Upholstery leather is tanned in the same way as other leathers, and colored in the drums. Lighter-weight leathers, such as calfskin and skeepskin, are tanned by the vegetable process. Sheepskins are usually tanned in the paddle wheel or drum, and require only a few hours for the complete tanning process.

The process is often speeded up by the use of hexameta sodium phosphate. The hides or skins are treated with this chemical after bating, and are fully tanned in seven hours. Calfskins may be tanned by this process in two to three hours. The heavy hides for sole leather are tanned in six to seven days.

Mineral Tanning

Mineral tanning is usually called *chrome tanning* in the leather industry. It is used chiefly for tanning the upper leather of shoes. Large quantities of chrome-tanned leather are used for manufacturing handbags. Chrome leather, thoroughly impregnated with greases and waxes, is used for such mechanical purposes as hydraulic rams, pump gaskets, and oil seals.

After the hides or skins have been bated and washed, they are pickled with a solution of acid and common salt. This requires four to eight hours. Pickling neutralizes all the alkali (lime) which may be present after bating, and also dehydrates the hide fibers. Paddle wheels continuously agitate the hides during the pickling process. When the operation is complete, the hides or skins are removed and piled flat to drain for 24 to 48 hours.

The two methods for chrome tanning in general use are the two-bath process and the one-bath process. Each produces a distinctly different type of leather.

The Two-Bath Process. The pickled skins or hides are placed in a tanning drum containing a solution of common salt, bichromate of soda, and acid. The hides or skins are stirred about in this for a short time, or until a cross section of the hide or skin shows that the bichromate has penetrated. Then more acid is added, and milling continues an hour or more. Sodium thiosulfate is then added and milling is continued. After two or three hours, the solution in the drum changes in color from orange to green-blue. This is because the bichromate of soda has been reduced to a chromium sulfate or chloride, depending on the acid used.

The leather is considered tanned when it withstands boiling. It is taken from the drum and permitted to drain.

The One-Bath Method. The bichromate of soda is reduced beforehand, and the resulting chrome liquor is bluish-green. The leather is placed into a tanning drum with water, salt, and the one-bath chrome liquor. It is milled in this solution until the stock can withstand boiling. Then it is removed from the drum and drained. The tanning requires 5 to 10 hours.

Dyeing Leather

After leather has been tanned by any process, it is drained and sorted for the different types of leather it will produce. The leather is then split and shaved to a uniform thickness. It is now ready for the coloring operation, performed in closed drums. Warm water washes away all soluble salts. The leather is dyed with a number of aniline dyes and natural wood dyes, as well as with a number of common tanning materials. About a hundred aniline dyes are used specifically for leather coloring.

It is nearly impossible to obtain color on leather with a single dye. It requires from two to seven coloring materials to obtain a desired shade. It is not so much a matter of color or shade as of durability, depth, and fastness of color. This requires combinations of coloring materials that may include tannin, wood dye, acid and basic aniline dyes, each used in its proper order.

The time required for dyeing may vary from one to three hours. The leather is colored immediately after it is washed, and is not removed from the drum. The coloring matter, dissolved in the proper amount of water, is added to the revolving drum. Usually the wood dye or tannin is added first, followed shortly by an acid or a basic aniline dye. Sometimes both the acid and aniline dyes are used.

Fat Liquoring

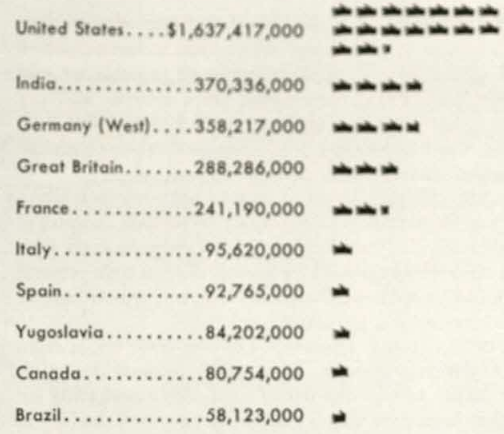
Every kind of leather must be treated with an oil or grease so that the fibers, which are in the form of knotted bundles, may be flexible and strong. This process, called *fat liquoring*, usually takes place in the last stage in which the leather is wet. A number of oils and greases are used in fat liquoring.

The soaps used in fat liquoring include both hard and soft soaps. An important requirement of leather soap is that its fatty matter remain liquid at low temperatures.

The fat-liquoring operation requires less than an hour. The leather at this stage readily absorbs the oils and greases, so it is important that the proper amount of soap be used, to avoid discoloration.

After the fat liquoring, the leather is removed from the drum and drained. It goes into machines which remove excess water, iron out the wrinkles, and press down the grain. The leather is then hung to dry.

TEN LEADING LEATHER COUNTRIES



United States	$1,637,417,000
India	370,336,000
Germany (West)	358,217,000
Great Britain	288,286,000
France	241,190,000
Italy	95,620,000
Spain	92,765,000
Yugoslavia	84,202,000
Canada	80,754,000
Brazil	58,123,000

Each symbol stands for $100,000,000 of value added by manufacturing.
Based on official government statistics.
(Figures for Russia and satellite countries not available.)

The dried leather is piled up for three to five days to absorb moisture from the atmosphere. After this, the leather is *sammied*. It is dipped in warm water for a minute or two, then placed in damp sawdust which absorbs about 35 per cent of the moisture. This requires 24 to 48 hours. The leather is then tacked on boards, or *toggled* on perforated metal frames. When tacked on boards, the leather requires 24 to 36 hours in which to dry. The metal toggle frames provide a faster method for drying leather. When stretched on these frames, the leather can dry thoroughly in about an hour.

Another method of setting and drying leather is called *pasting*. This process consists of applying a mild paste to the grain side of the skin, then setting the skin by hand onto a smooth surface, usually lacquered paper cardboard. Aluminum cores strengthen these boards. Glass or enameled steel also is used.

The purpose of tacking, toggling, or pasting the leather is to stretch it, as well as to make it firm and flat. After the leather is dried and stretched by either method, it is trimmed around the edges. It is then ready to undergo one of the many finishing processes.

Finishing Leather

The materials used for finishing leather include casein, shellac, blood serum, milk, gum tragacanth, flaxseed, Irish moss, alphaprotein (a soybean product), Japan wax, carnauba wax, candelilla wax, sulfated oil, pigments of all kinds, and aniline dyes. Solutions or emulsions of these materials are prepared and applied to the grain surface of the leather. Between applications, there are mechanical operations such as rolling, glazing, and smoothing. As many as seven coats of the finishing solution are applied to the finest kinds of leather.

Patent leather is produced by applying three coats of a heavy, oily varnish at the end of the finishing process. This gives it a high gloss. August C. Orthmann

Related Articles in World Book include:

Buckskin
Chamois
Crocodile
Fabrikoid
Leathercraft
Morocco (leather)
Shoe
Suede

LEATHERBACK. See Turtle.

LEATHERCRAFT is the art of working with leather. As a hobby, it gives great satisfaction to both children and adults. Many simple leathercraft projects are sold in kit form. They include link belts, wallets, and key purses that children can put together easily. But such projects as hand-tooled, leather-topped tables challenge experienced craftsmen.

Many different kinds of leather are used in leathercraft work. Kits sold in hobby shops include the proper leather for the particular project. Leathercrafters who buy their leather in bulk frequently discuss their projects with hobby dealers to help decide which type of leather will be best for a particular purpose.

The simplest leathercraft kits are little more than leather lacing projects. They teach manual dexterity, but do not require the use of tools. After perfecting his leather lacing technique, the hobbyist often decides to make a complicated wallet or key case with an interesting carved design.

Types. Many types of leather work may be made. *Flat modeling*, the simplest, is done by tracing a design on leather and pressing the background down with a tool. *Embossing* means creating a raised design by tooling the underside of the leather. *Cut-out designs* are attached to objects as decorations. *Carving* on heavy leather is much like wood carving. *Leather inlay designs* are made by pressing small pieces of leather onto a leather base. *Skiving* involves thinning or splitting leather to prevent bulging. *Burning* is done with an electric tool, as in woodburning.

Tools. The *swivel knife* is the most important single leathercraft tool because it forms the basis of the total design worked into the leather. The *camouflage* is a crescent-shaped tool used primarily to give stems or flower petals a ruffled appearance representing small veins. The *shader* is a stamp tool with the working end shaped like a raindrop. It makes dish-shaped impressions in the designs. The *beveler* knocks down one side of each swivel knife cut to give a three-dimensional effect to the design. The *seeder* fills in the seed pods of flowers. The *mule's foot* is V-shaped, and makes dead-end cuts and decorates stems. Two general types of *background tools* are used. One taps the background down to the same depth as the swivel cuts. The other may be called a *matting tool* because it changes the texture of the area with a minimum of stretching. JACK WAX

See also PYROGRAPHY.

LEATHERNECKS. See MARINE CORPS, UNITED STATES.

LEAVEN, *LEHV un*, is a substance that causes fermentation of dough in breadmaking. A leaven acts by causing the formation of carbon dioxide gas which bubbles through and lightens the batter or dough while it is baking. Yeast, sour milk and soda, and baking powder are common leavens.

See also BREAD (History); YEAST.

LEAVENWORTH, *LEHV un worth*, Kans. (pop. 22,052; alt. 765 ft.), the oldest city in the state, is a distributing and manufacturing center. The city lies on the Missouri River about 30 miles northwest of Kansas City (see KANSAS [map]). Its factories make furniture, batteries, cotton gloves, flour, mill machinery, and foundry and steel products.

Fort Leavenworth was established near the site of the city in 1827. For many years it was the most important army post on the western frontier. The U.S. Army's Command and General Staff College is at Fort Leavenworth. Leavenworth Prison is also in the fort. The city has a commission government. WILLIAM F. ZORNOW

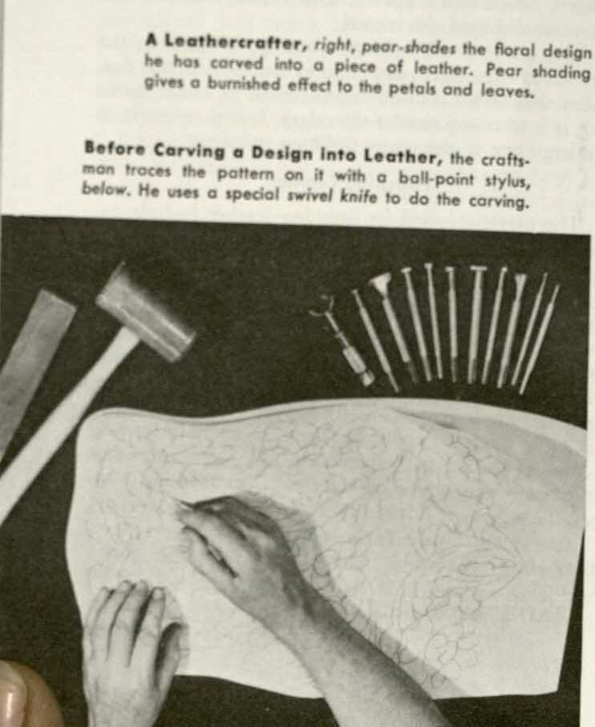
LEAVENWORTH PRISON is one of the six federal penitentiaries in the United States. It is on the Fort Leavenworth reservation on the Missouri River north of Leavenworth, Kans. Besides the buildings of the civil prison, a federal military prison also stands on the grounds of the fort. Leavenworth Prison was established in 1863. It has room for about 2,000 prisoners.

LEAVES. See LEAF.

A Leathercrafter, *right, pear-shades* the floral design he has carved into a piece of leather. Pear shading gives a burnished effect to the petals and leaves.

Leisure Crafts

Before Carving a Design into Leather, the craftsman traces the pattern on it with a ball-point stylus, *below.* He uses a special *swivel knife* to do the carving.



Authenticated News

The Place des Canons in Beirut, Lebanon, is one of the main commercial squares in the modern section of the city.

LEBANON, *LEB uh nuhn*, is a small, independent republic at the eastern end of the Mediterranean Sea. The name comes from the snow-capped Lebanon Mountains. In the Arabic language, it is LUBNAN. Lebanon's capital and largest city is Beirut.

Lebanon has been an important center for trade between Asia and Europe for more than 4,000 years. Such cities as Byblos, Sidon, and Tyre became great Phoenician seaports on the eastern shore of the Mediterranean. But Lebanon did not become independent until after World War II. Most of the people speak Arabic. Half of Lebanon's people are Moslems and half Christians.

Lebanon is sometimes called "the playground of the

FACTS IN BRIEF

Type of Government: Republic.

Capital: Beirut.

President: Chosen for a six-year term by the Chamber of Deputies.

Parliament: A single Chamber of Deputies with 66 members elected for four-year terms.

Area: 4,000 square miles. *Greatest distance:* (north-south) 120 miles; (east-west) 50 miles. *Coast line,* 125 miles.

Elevation: *Highest,* Qurnet es Sauda, 10,131 feet; *lowest,* sea level.

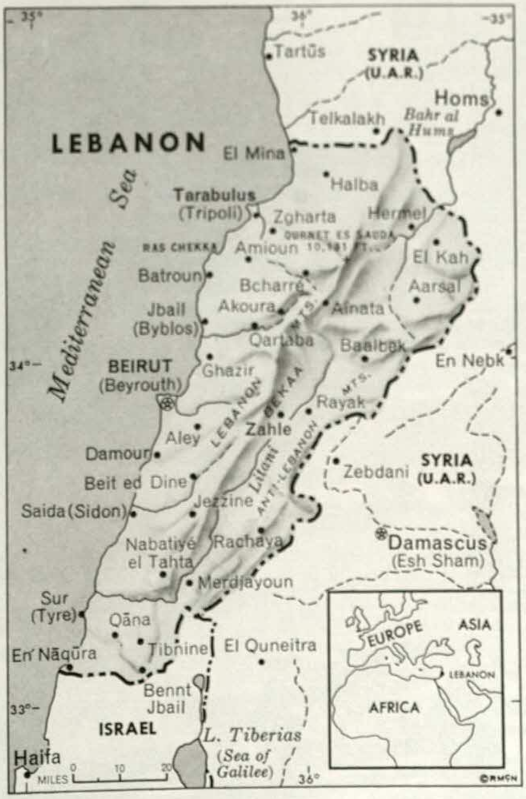
Population: 1,303,940. *Density,* 326 persons per sq. mi.

Chief Products: *Agriculture,* apples, bananas, barley, citrus fruits, cotton, figs, grapes, nuts, olives, tobacco, wheat. *Manufacturing and Processing,* cement, cigarettes, foods, leather, matches, silk and cotton fabrics, soap.

National Anthem: "al Lahan al Watani al Lubnani" ("The National Anthem of Lebanon").

Flag: The flag has a broad white stripe between two narrower red stripes with a cedar tree in the center. See FLAG (color picture, Flags of Asia).

Money: *Basic unit,* Pound. For its value in dollars, see MONEY (table, Values).



The Cedars of Lebanon, *right,* have been famous since Biblical times. They grow high in the snow-covered Lebanon Mountains, a popular Near Eastern winter-resort area.

Ruins at Baalbek, Lebanon, *left,* show the splendor of early Roman architecture. The six columns belong to an old Roman temple of Jupiter.

Black Star

Black Star

Near East," because it provides warm-weather sports along the coast, and winter sports in the mountains.

The Land and Its Resources

Location, Size, and Surface Features. Lebanon covers an area about four fifths the size of Connecticut. The country lies along the eastern Mediterranean Coast. The *Map* shows that Syria lies to the north and east, and Israel to the south. Lebanon covers 4,000 square miles.

Lebanon is made up of three geographic areas: (1) a narrow coastal strip, in some places barely wide enough for a highway; (2) the Lebanon Mountains, which run parallel to the coast for almost the length of the country; and (3) a fertile inland plain called the *Bekaa*, or *Bica*. The Bekaa lies between the Lebanon and the Anti-Lebanon Mountains, which rise along the Syrian border on the east.

Rivers. Lebanon has only one important river, the Litani. It flows south from the inland Bekaa plain, and then turns westward to enter the Mediterranean between Saida and Tyre.

Natural Resources. For centuries, Lebanon has been a source of building stone and marble. The famous cedars of Lebanon once furnished wood for the whole Near East. They are carefully conserved today in several national parks (see CEDAR; TREE [Trees of Mediterranean Countries]). Lebanon has small deposits of iron, lignite (brown coal), and asphalt. Lebanon's shortage of natural resources has caused the country to rely on trade as the chief source of revenue.

Climate. Lebanon has a temperate climate, with a rainy season from late October to May. The average temperature ranges from about 50° to 80°F. Summer weather is hot in the lowlands, but pleasant in the mountains, except when the *khamsin*, a scorching desert wind, blows westward from Syria. Lebanon averages more annual rainfall than nearby countries. About 20-40 inches of rain fall annually. Beirut usually has about 37 inches of rain a year.

The People and Their Work

The People of Lebanon have been traders from early days. Most of the people are Arabs. There also are many Armenians who came to Lebanon as refugees from Turkey after 1914. About 120,000 Arab refugees arrived during the Arab-Israeli war in 1948 and 1949.

Cities. Beirut (Beyrouth, pop. 211,006) is the capital and chief seaport of Lebanon. Tarabulus El Sham (Tripoli, pop. 70,842); Saida (Sidon, pop. 18,488); and Tyre (Sur, pop. 9,455) were ancient Mediterranean ports. Other cities, together with their populations, include Zahle (20,840); Zgharta (9,000); Baalbek (8,000); Aley (5,000); Batroun (5,000); and Qana (5,000). See BAALBEK; BEIRUT; TARABULUS EL SHAM; TYRE.

Agriculture and Industry. More than half of the people of Lebanon are farmers. Their standard of living is quite high. Many of them own their own small farms, and raise grain, olives, and fruits. The highlands are cultivated in terraces. Christian missionaries brought the silk worm to Lebanon in the 500's. This was the beginning of an important industry. Lebanese women specialize in making fine embroidery.

Trade. Two pipelines from the rich oil fields of Iraq and Saudi Arabia end in Lebanon. This makes the country an important center of the East-West oil trade. Lebanon exports such items as textile fibers, grain, vegetables, fruits, and nuts to Syria, Saudi Arabia and other Near Eastern countries, the United States, and Great Britain. The chief imports into Lebanon are machinery and vehicles, textiles, manufactured goods, wheat, flour, and oil. Most imports come from the United States, Great Britain, and France.

Transportation. Nearly 20,000 motor vehicles provide transportation in Lebanon. There are about 1,800 miles of good roads. By comparison, Lebanon has less than 500 miles of railroads, used chiefly to haul freight. Beirut's international airport is one of the most important in the Near East.

Social and Cultural Achievements

Education. Lebanon has the highest literacy rate of any Near Eastern country. About 75 out of every 100 people can read and write. Students may attend more than 1,000 public schools; several trade, technical, and agricultural schools; and a teacher-training school supported by the Government. These schools serve more than 96,000 students a year. Because of the large number of French and American citizens living in Lebanon, there also are many French schools, and some schools controlled by Americans. All these schools teach Arabic, and either French or English. The American University of Beirut and the French Université Saint-Joseph were founded at Beirut in the late 1800's. Students from all parts of the Near East study at the American University of Beirut. The National University was opened in Beirut in 1951.

Religion. About 51 out of every 100 people in Lebanon are Christian, and the other 49 are Moslem. The Christian population is divided into more than ten different sects. The largest single group is that of the *Maronite* Christians, who make up almost a third of the total population. The Maronites are descended from the Christian Arabs who lived in Lebanon before the Moslems. Their church is affiliated with the Roman Catholic Church. The Moslems are divided between the *Sunni*, or orthodox Moslems, and several sects, including the *Shiites*. The *Druses*, members of one Moslem sect, are important because of their powerful family organizations. There are only about 80,000 Druses in Lebanon. There are a few thousand Jews.

Government

Lebanon's one-chamber parliament, the Chamber of Deputies, is chosen by the people on the basis of religion, in what is called *confessional representation*. Each Christian or Moslem sect elects representatives in proportion to its size. The president of Lebanon is always a Christian, and usually a Maronite. The prime minister, always a Sunni Moslem, is the head of the government. He is chosen by the president, but is responsible to the Chamber of Deputies. The president of the Chamber is always a Shiite Moslem. All qualified citizens, including educated women, are required by law to vote when elections are held in Lebanon.

History

Early Days. At the time when great civilizations grew up in the valley of the Nile River, and in the valleys of the Tigris and Euphrates rivers, the land that is now Lebanon became an important link between the two areas. The eastern shore of the Mediterranean Sea became the base for the great sea-trading empire of the Phoenicians. Byblos, Sidon, Tyre, and other cities grew up in the Phoenician Empire before 2000 B.C. In the coastal land and in Syria, the Egyptians, the Hittites, the Assyrians, and the Babylonians fought wars for the area. For more than 3,400 years, until the 1940's, the area now called Lebanon shared Syria's history. See PHOENICIA; SYRIA (History).

The Province of Lebanon. Lebanon and Syria were parts of the Ottoman, or Turkish, Empire from 1517 to 1918. In the Lebanon Mountain area in the 1860's, Maronite Christian peasants revolted against the Druses, a sect of Moslems who were their overlords. French troops landed to protect the Lebanese Christians. France and Great Britain forced the Turks to give the province of Lebanon a special government, with a Christian governor. The Maronites were given many privileges. They and other Lebanese Christians did much in the 1800's to revive Arabic literature, and to spread a spirit of nationalism among the Arabs. At the end of World War I, the Ottoman Empire was broken up into small states. The League of Nations gave France a mandate over the area that is now Syria and Lebanon. The French changed Lebanon's traditional boundaries.

The Republic of Lebanon. The French gave the country a republican constitution in 1926, and confirmed the system of government by religious groups. The French also set up a customs union of Lebanon and Syria. Under the union, Syrian exports helped pay for Lebanese imports.

In 1941, Lebanon was proclaimed an independent republic by Free French and Lebanese officials. In its first election, in 1943, Bechara el-Khoury became the first president. But the French jailed him and his cabinet late in 1943, for changing the constitution. It was not until French troops were withdrawn in December, 1946, that Lebanon became completely independent. Free parliamentary elections were held in 1947. Lebanon joined the Arab League and the United Nations in 1945, and the Arab war with Israel in 1948.

Early in 1950, Syria and Lebanon broke their customs union. To make up for its losses, Lebanon increased the price it charged other countries for shipping oil.

Elections held in April, 1951, were free and orderly. President Bechara el-Khoury was forced to resign in September, 1952, because of charges of corruption in the Government. He was followed by Camille Chamoun, who began many governmental reforms. Chamoun also pressed for closer ties with the other Arab states and with western nations.

With economic aid from the United States, in the early 1950's Lebanon began projects to increase its water supply. In 1957, work was begun on a power and irrigation project on the Litani River.

In May, 1958, Lebanese rebels revolted against President Chamoun's pro-Western government. Government officials charged that the United Arab Republic had encouraged the uprising. When the government of nearby Iraq was overthrown in July, President Chamoun asked the United States for protection. The United States sent more than 6,000 marines to protect the Lebanese government. Late in July, the Chamber of Deputies elected General Fouad Chebab, chief of the armed forces, as president. The United States troops were withdrawn by October, 1958. Russia and Lebanon signed an agreement in 1959, providing for increased trade between the two countries. CHRISTINA PHELPS HARRIS

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LEBANON MOUNTAINS form a range in Lebanon that extends for about 100 miles along the eastern shore of the Mediterranean Sea. Geologically, these mountains are part of a much longer coastal range extending from Turkey through Israel. The average height of the Lebanon mountain peaks is from 6,000 to 7,000 feet above sea level. The most famous peaks, Qurnet es Sauda and Jebel Sannin, tower about 10,000 feet. In Biblical times, the upper slopes of these mountains were covered with the famous "Cedars of Lebanon," few of which remain. King Solomon obtained wood from these cedars to build his beautiful temple in Jerusalem (I Kings 5: 6-10). Christina Phelps Harris

LEBANON VALLEY COLLEGE is a coeducational college of arts and sciences at Annville, Pa. It is controlled by the Evangelical United Brethren Church. The college, founded in 1866, has cooperative programs with four other schools. For enrollment, see Universities and Colleges (table).

LE BEL, *luh BELL,* **JOSEPH ACHILLE** (1847-1930), a French industrial chemist, discovered that molecules are three-dimensional. Chemists had observed that certain organic compounds, having apparently the same formula, reacted differently to polarized light. Le Bel showed that the arrangement of atoms in these compounds varies, and accounts for the differences in behavior.

Working independently, he and Jacobus H. van't Hoff of The Netherlands published this theory about the arrangement of atoms in compounds almost simultaneously. Le Bel was born in Alsace. Henry M. Leicester

LEBLANC, *luh BLAHN,* **MAURICE** (1864-1941), a French novelist, won the Legion of Honor for his detective fiction. His book *Arsène Lupin: Gentleman-Cambrioleur* (1907) introduced a series of novels about a gentleman burglar who later became a detective. Leblanc was born in Rouen, France. Henri Peyre

LEBLANC, NICOLAS (1742-1806), a French physician, surgeon, and industrial chemist, melted together sodium sulfate, limestone, and coal to produce soda economically. In 1794, the French revolutionary government seized Leblanc's patent and his factory. Leblanc received no payment for his property or patent. Although many persons made fortunes by using his process, Leblanc lived in poverty. Henry M. Leicester

LE BRIS, JEAN-MARIE. See Glider (Early Experiments).

LE BRUN, CHARLES. See Furniture (Louis XIV).

LECHWE. See Antelope (picture).

LECITHIN. See Soybean (The Bean).

LECLANCHÉ CELL. See Battery (Open-Circuit Cells).

LECOMPTON. See Kansas (Interesting Places to Visit).

LE CORBUSIER, *luh KAWR BYOO ZYAY* (1887-   ), is the professional name of Charles Édouard Jeanneret, a Swiss architect. He won international fame as a designer of buildings in the functional, or *International* style. He also became known as a painter and writer.

Le Corbusier was born and educated in La Chaux-de-Fonds, Switzerland. He studied in Paris and in Germany. He returned to Paris in 1918 and spread his theories of modern home and city planning. He designed houses as "machines for living," and used glass walls, open-floor plans, and buildings on stilts, long before they were accepted by other architects. His work in city planning includes a project for a city of 3,000,000 persons and a new capital city for India.

His better-known buildings include the studio houses at Boulogne-sur-Seine, the Savoye house at Poissy, and a large apartment house in Marseille. Le Corbusier was a leading member of the international team of architects that designed the United Nations headquarters in New York City in the 1950's. See also Chandigarh. William T. Arnett

Barbara Morgan

Le Corbusier

LEDA. See Castor and Pollux.

LEDERBERG, JOSHUA (1925-   ), an American geneticist, shared the 1958 Nobel prize for medicine and physiology. He received the award "for his discoveries concerning genetic recombination and the organization of the genetic material of bacteria." Lederberg was born in Montclair, N.J. Henry H. Fertig

LEDGER. See Bookkeeping (The Bookkeeping Cycle).

LEDO ROAD. See Stilwell Road.

LEE, ANN. See Shakers.

LEE, CHARLES (1731-1782), was an officer in the American Army during the Revolutionary War. Although he fought bravely, he was not always obedient, and some historians regard him as a traitor.

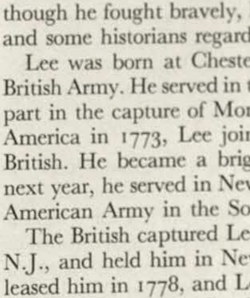
Lee was born at Chester, England, and joined the British Army. He served in the Seven Years' War, taking part in the capture of Montreal in 1760. Returning to America in 1773, Lee joined the patriots against the British. He became a brigadier general in 1775. The next year, he served in New York and commanded the American Army in the South.

The British captured Lee in 1776 at Basking Ridge, N.J., and held him in New York for a year. They released him in 1778, and Lee returned to fight with the patriot forces. At the Battle of Monmouth in 1778, he advanced with the American forces against the British Army, then retreated. Lee asked for a court-martial, and he was found guilty of misconduct. John R. Alden

LEE, DORIS EMRICK (1905-   ), is an American artist. Her paintings portray the American scene in a

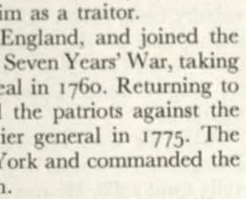
Charles Lee

Brown Bros.



Doris Emrick Lee

Wide World



lively, sometimes humorous, and always colorful manner. Her painting *Thanksgiving* won the Logan medal at the 1935 annual exhibition of contemporary American painting at the Art Institute of Chicago. She painted a mural for the Post Office Department building in Washington. Doris Lee was born at Aledo, Ill. She studied at the Kansas City Art Institute, at the California School of Fine Arts, and in Paris. Edwin L. Fulwider

LEE, FRANCIS LIGHTFOOT (1734-1797), a signer of the Declaration of Independence, was active in the American Revolutionary movement. As a member of the Virginia House of Burgesses, he helped lead the protest against the Stamp Act and other British measures that were unpopular with the colonies. He helped form the Virginia Committee of Correspondence (see Committees of Correspondence). In 1775, Lee was elected as a delegate to the Continental Congress, where he ably served the colonial cause. He resigned in 1779 to return to his plantation. Lee was a brother of the Revolutionary leader Richard Henry Lee and a relative of Confederate General Robert E. Lee. He was born in Westmoreland County, Virginia. Clarence L. Ver Steeg

LEE, HENRY (1756-1818), was an American soldier and statesman of the Revolutionary period. His success as a scout and in making lightning raids won him the nickname of "Light-Horse Harry." He was the father of Confederate General Robert E. Lee.

Lee became a captain in the Virginia cavalry in 1776, and the next year his company joined George Washington's army. In 1778, Lee became a major in charge of a cavalry troop called "Lee's Legion," which he led in a daring raid on the British post at Paulus Hook, N.Y. (now Jersey City, N.J.). As a lieutenant colonel in 1780, he fought under General Nathanael Greene in the Carolinas.

After the war, Lee entered the Virginia House of Delegates. He served in the Continental Congress from 1785 until 1788. He was also a member of the Virginia convention that ratified the United States Constitution. Lee served as governor of Virginia from 1792 to 1795, and commanded the troops that President Washington sent in 1794 to crush the Whisky Rebellion (see Whisky Rebellion). Lee was a member of the Federalist party. From 1799 to 1801, he served in Congress. He wrote the famous epitaph of George Washington, "First in war, first in peace, and first in the hearts of his countrymen."

"Light-Horse Harry" Lee was a brave and daring cavalry leader in the American Army during the Revolutionary War.

Chicago Historical Society

Lee fell deeply into debt in later years, and was imprisoned in 1808 and 1809. During this time, he wrote his *Memoirs of the War in the Southern Department of the United States*. In 1812, he was injured while trying to protect a friend from rioters in Baltimore. He never recovered from this injury.

Lee was born on Jan. 29, 1756, at "Leesylvania," Prince William County, Virginia. He was graduated from the College of New Jersey (now Princeton University) in 1773. John R. Alden

See also Lee, Robert Edward.

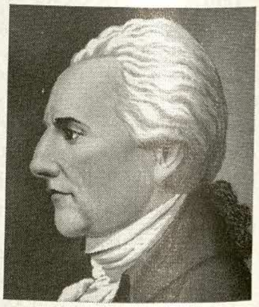
LEE, JASON (1803-1845), was a Methodist missionary. He is remembered for his missionary expeditions to the Oregon region, for his support of popular education, and for his work in helping to form the Oregon territorial government. Lee was born in Stanstead, Que., and attended Wesleyan Academy, Wilbraham, Mass. In 1830 he was licensed to preach, and in 1833 was sent to Oregon. He traveled with the explorer Nathaniel Wyeth to Fort Vancouver, and established several schools in the Pacific Northwest.

A statue of Jason Lee represents the state of Oregon in Statuary Hall. L. J. Trinterud

LEE, RICHARD HENRY (1732-1794), was a signer of the Declaration of Independence. With Patrick Henry and Thomas Jefferson, he helped lead the patriot cause in Virginia.

Lee was born at Stratford, Va., and was educated in England. In 1758, he was elected to the Virginia legislature, where he served until the outbreak of the Revolutionary War. He became especially active in Virginia's campaign of resistance to the Stamp Act and Townshend Acts.

Richard Henry Lee



In 1774, Virginia sent Lee as a delegate to the First Continental Congress in Philadelphia. At first, he favored a policy of economic pressure on the British government. But, by late 1775, he began to think and plan in terms of independence. On June 7, 1776, Lee introduced a resolution that "these united colonies are, and of right ought to be, free and independent states; that they are absolved from all allegiance to the British Crown; and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved." The adoption of this resolution on July 2 was the signal for American independence.

Lee was elected president of the Congress in 1784. He helped lead the opposition to the ratification of the United States Constitution, but served as a U.S. Senator from Virginia after it was adopted. Lee's last great service was the enthusiastic support he gave to the successful movement to add the Bill of Rights to the Constitution.

Clinton Rossiter

LEE, ROBERT EDWARD (1807-1870), was a great general who commanded the Confederate Army in the Civil War. He is one of the most beloved figures in American history. Lee's fame rests on his military achievements as Confederate commander in the face of overwhelming odds, and on his outstanding personal character. He won the admiration and respect of Northerners as well as Southerners.

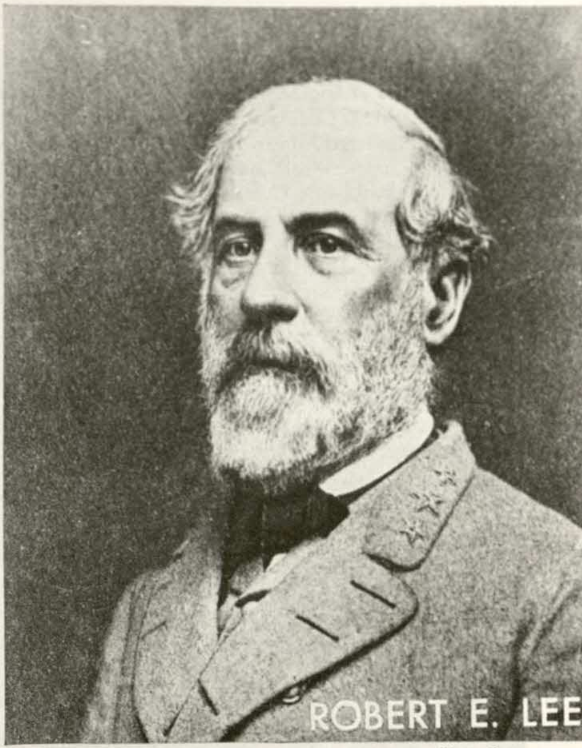
Lee fought for one section of the young nation, but the struggle did not make him intolerant. He fought, not for personal gain, but to prove himself worthy of a cause. Union General Ulysses S. Grant, to whom Lee was finally forced to surrender, said: "There was not a man in the Confederacy whose influence with the whole people was as great as his."

Unlike President Abraham Lincoln, who led the North in the Civil War, Lee was not a self-made man. Lee's family was the leading family of Virginia, and one of the most distinguished in the nation. A kinsman, Thomas Lee, had served as royal governor of the colony. Lee was also related to Francis Lightfoot Lee and Richard Henry Lee, who had been statesmen and soldiers in Revolutionary War days. His father, Henry Lee, known as "Light-Horse Harry," was a brilliant cavalry commander in the Revolutionary War. When the Lee mansion, Stratford, burned in the early 1700's, Queen Anne of England gave money to help rebuild it.

Lee was a handsome and vigorous man, 5 feet 10½ inches tall and weighing about 170 pounds. He presented a commanding appearance—straight, alert, and intelligent. He was never known to smoke, drink alcoholic beverages, or use profane language. Lee was a moralist above all else, and once said that *duty* is the sublimest word in the English language.

Early Years

Lee was born at Stratford, in Westmoreland County, Virginia, on Jan. 19, 1807. He grew up with a deep devotion to country life and to his native state, which continued throughout his life. He was a serious boy, and spent many hours in his father's library. In 1825 he entered the United States Military Academy at West Point, where his classmates admired him for his brilliance, leadership, and devotion to duty. He was graduated with high honors in 1829, and he was commis-



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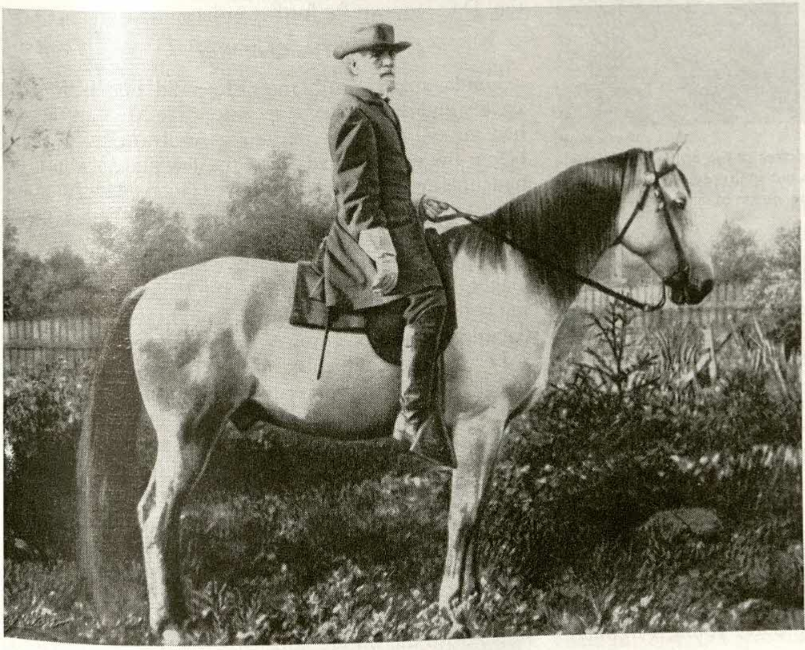


Lee posed astride his famous horse, "Traveller," which he rode throughout the Civil War. The famous Southern general was known for his dignity and calm, even in times of stress.

sioned as a second lieutenant in the Corps of Engineers.

In the Corps of Engineers. Lee served for 17 months at Fort Pulaski on Cockspur Island, Georgia. In 1831, the army transferred him to Fort Monroe, Virginia, as assistant engineer. While stationed there, he married Mary Ann Randolph Custis, Martha Washington's great-granddaughter. They lived in her family home, Arlington, which still stands on a Virginia hill overlooking Washington, D.C. Their seven children—George Washington Custis, Mary, William H. Fitzhugh, Agnes, Annie, Robert Edward, and Mildred—were reared chiefly at Arlington. Two sons, George and William, later served as Confederate officers under Lee during the Civil War.

Brown Bros.

Lee's Army defeated General Hooker at the Battle of Chancellorsville in May, 1863, even though outnumbered. But the Confederates suffered a serious loss in the death of Stonewall Jackson.

Lee served as an assistant in the chief engineer's office in Washington from 1834 to 1837, but spent the summer of 1835 helping to lay out the boundary line between Ohio and Michigan. His first important independent job came in 1837 when, as a first lieutenant of engineers, he supervised the engineering work for St. Louis harbor and for the upper Mississippi and Missouri rivers. His work there earned him a promotion to captain. In 1841 he was transferred to Fort Hamilton in New York harbor, where he took charge of building fortifications.

The Mexican War. When war broke out between the United States and Mexico in 1846, the army sent Lee to Texas as assistant engineer under General John E. Wool. All his superior officers, especially General Winfield Scott, were impressed with the brave young Virginian.

Early in the war, Lee supervised the construction of bridges for Wool's march toward the Mexican border. He then did excellent work on scouting trips. He was shortly transferred to General Winfield Scott's command and took part in the capture of Veracruz. Lee's engineering skill made it possible for American troops to cross the difficult mountain passes on the way to the capital. During the march to Mexico City, Lee was promoted to brevet major, then to brevet lieutenant colonel. He became a brevet colonel before the war ended.

The official reports praised Lee highly. Scott declared that his "success in Mexico was largely due to the skill, valor, and undaunted courage of Robert E. Lee . . . the greatest military genius in America."

Superintendent of West Point. After three years at Fort Carroll in Baltimore harbor, Lee became superintendent of West Point in 1852. He would have preferred duty in the field, instead of at a desk, but assumed his post without complaint. During his three years at West Point, he improved the buildings and the courses, and spent much time with the cadets. One cadet, "Jeb" Stuart, later served as one of Lee's best cavalry officers. Lee won a reputation during his service there as a fair and kind superintendent.

Other Duties. In 1855, Lee became a lieutenant colonel of cavalry and was assigned to duty on the Texas frontier. There he helped protect settlers from attacks by the Apache and Comanche Indians. Once again he proved to be an excellent soldier and organizer. But these were not happy years for Lee. He did not like to be away from his family for long periods of time, particularly because of Mrs. Lee, who was becoming an invalid. Lee came home to see her as often as possible. He happened to be in Washington at the time of John Brown's raid on Harpers Ferry in 1859, and was sent there to arrest Brown and restore order. He accomplished this task quickly and with little loss of life, then returned to his regiment in Texas. When Texas seceded from the Union in 1861, Lee was recalled to Washington, D.C., to wait for further orders.

The Civil War

Unlike many Southerners, Lee did not believe in slavery and did not favor secession. He felt that slavery had an evil effect on masters as well as slaves. Long before the war, he had freed the few slaves whom he had inherited. Lee greatly admired George Washington, and hated the thought of a divided nation. But he came to feel that his state was protecting the very liberty, freedom, and legal principles for which Washington had fought. He was willing to leave the Union, as Washington had left the British Empire, to fight what the South regarded as a second war of independence.

Lee had great difficulty in deciding whether to stand by his native state or remain with the Union, even though Lincoln offered him the field command of the United States Army. He wrote his sister: ". . . in my own person I had to meet the question whether I should take part against my native state. With all my devotion to the Union, and the feeling of loyalty and duty of an American citizen, I have not been able to make up my mind to raise my hand against my relatives, my children, my home. I have therefore resigned my commission in the army, and, save in defence of my native state—with the sincere hope that my poor services may never be needed—I hope I may never be called upon to draw my sword."

Lee grieved at parting from the companions with whom he had served in other wars. He had always felt that the "cordiality and friendship in the army was the great attraction of the service." The break with General Scott, his commander in chief, was especially difficult because the two men were close friends.

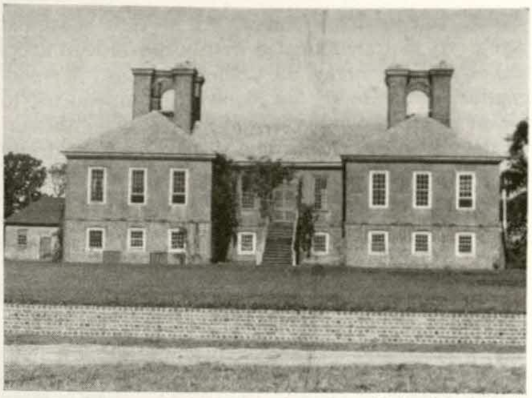
Opening Campaigns. For a time after Lee joined the Confederate Army, he had no troops under his command. He served in Richmond, Va., as military adviser to Confederate President Jefferson Davis, and in May, 1861, was appointed a full general. In the fall, he took charge of fortifying the coast of South Carolina against invasion. Later, he succeeded in halting a threatened invasion from western Virginia. Returning to Richmond in 1862, he helped draw up plans for the Confederate forces in Virginia, then under the command of General Joseph E. Johnston. Johnston was wounded on May 31, 1862, in the Battle of Fair Oaks (Seven Pines). The next day, Lee took command of Johnston's army, which he called the Army of Northern Virginia.

From his first day of command, Lee faced what looked like an impossible task. Union General George B. McClellan had approached within 7 miles of Richmond with 100,000 men. Three forces were closing in on the Confederate troops of General "Stonewall" Jackson in the Shenandoah Valley of Virginia. A fourth Union force was camped on the Rappahannock River, ready to aid McClellan. In a series of engagements known as the Battles of the Seven Days, Lee forced McClellan to retreat. This campaign taught Lee the need for simpler methods and organization. At the same time, Jackson conducted a brilliant campaign in the Shenandoah Valley, and soon became Lee's most trusted subordinate. Jackson was so devoted to Lee that he said he would follow his commander into battle blindfolded.

With Jackson's help, Lee won a major victory over General John Pope in the second Battle of Bull Run (Manassas), in August, 1862. He was then free to invade Maryland. Unfortunately, McClellan intercepted a battle order which a Confederate staff officer had carelessly lost. Knowing Lee's plans in advance, McClellan halted him in the Battle of Antietam (Sharpsburg). Lee returned to Virginia to reorganize his army.

Later Battles. General Ambrose E. Burnside led an attack against Lee in December, 1862, at Fredericksburg, Va. It was on this occasion that Lee made a statement that has since become famous. Fog covered the battlefield early in the morning before the battle began. As it lifted and the Confederate command surveyed the panorama of thousands of troops in full array, Lee remarked: "It is well that war is so terrible—we would grow too fond of it."

Lee's troops badly defeated the Union forces. But Lee could not take advantage of his victory. The Northern troops had been too cleverly placed, and could fall back without breaking their lines of communication. The Confederates had few reserves of men and supplies. Lee felt that his army could not win the war by fighting defensively, and that it was too costly simply to hold the enemy without destroying it. But first he had to fight another defensive battle.



H. Armstrong Roberts

Lee's Birthplace, Stratford, *above*, overlooks the Potomac River in Westmoreland County, Va. It was built in the early 1700's, and is preserved as a museum. So is his later home, Arlington, *below*, begun in 1802 by a step-grandson of George Washington. Arlington overlooks the Potomac in Arlington National Cemetery, Va.

Brown Bros.

General Joseph Hooker, who had taken over from Burnside, attacked Lee at Chancellorsville in the spring of 1863. The Confederate forces won a spectacular victory, but paid a terrible price for it—the death of Jackson, who was accidentally shot by his own men when he went ahead of his line of battle to scout.

Determined to take the offensive, Lee moved into Pennsylvania and encountered the Northern army now under General George G. Meade, at Gettysburg. Bitter fighting continued for three days, from July 1 to 3, 1863. Some of Lee's corps commanders failed to act quickly, and many historians have criticized General James Longstreet's delay in carrying out Lee's orders to attack. The Confederates met defeat in what proved to be a turning point of the war. Always generous to those under him, Lee insisted on taking the blame for the failure of the campaign.

Final Engagements. In the spring of 1864, Lee faced General Ulysses S. Grant for the first time. In a series of fierce and bloody battles called the Wilderness campaign, Grant pounded the Confederate army to pieces with his larger forces and guns. During one of these battles, Lee's men vividly demonstrated the affectionate regard they all felt for "Marse Robert." As a division of Texans marched past Lee on their way to the front, he left his post to join them. But the men insisted he return to the rear, saying "We won't go unless you go back!"

Lee held out for nine months in the siege of Petersburg, but his tired, hungry men finally had to retreat. Early in 1865, Lee was made general in chief of all the

Confederate armies. Richmond fell in April, 1865, and Lee's ragged army retreated westward. Northern forces cut off and surrounded the Confederate Army at Appomattox Court House, Va., where Lee surrendered to Grant on April 9, 1865. Grant tried to make the surrender as easy as possible, and allowed the Confederate troops to take their horses home for spring plowing. As Lee made his last ride down the lines on his famous horse "Traveller," he told his army: "Men, we have fought through the war together. I have done my best for you; my heart is too full to say more."

Last Years

Lee now became a private citizen for the first time in 40 years. The Proclamation of Amnesty and Reconstruction of 1865 barred him from taking public office. But he applied for a complete individual pardon as provided by the proclamation, hoping to set an example for other Southern leaders to follow. His pardon was not granted before his death, although a proclamation of 1868 restored his right to vote.

Lee could have had many positions of wealth and prestige, but he chose to spend his last years as president of Washington College in Lexington, Va. "I shall devote my remaining energies to training young men to do their duty in life," he said. He soon raised the small college to high levels of scholarship, and established schools of commerce and journalism. Young men from all parts of the South flocked to "General Lee's school," which was named Washington and Lee University after his death.

Lee urged his students and friends to keep the peace and accept the outcome of the war. His attitude was extremely important at a time when bitterness and hatred swept both North and South. Instead of increasing this feeling, Lee opposed it, doing everything in his power to restore the political, economic, and social life of the South. "Make your sons Americans," he urged.

His health began to fail in 1870, and, after a brief illness, he died on Oct. 12, 1870. People throughout the country felt his death as a personal loss. Viscount Garnet Wolseley, a distinguished British soldier, spoke eloquently of Lee:

"I have met many of the great men of my time, but Lee alone impressed me with the feeling that I was in the presence of a man who was cast in a grander mold and made of different and finer metal than all other men. He is stamped upon my memory as a being apart and superior to all others in every way—a man with whom none I ever knew, and very few of whom I have read, were worthy to be classed."

Lee is buried in the chapel he built on the campus in Lexington, along with other members of the Lee family. This chapel is sometimes called "The Shrine of the South," and is visited by thousands every year. Lee's home has been preserved in Arlington National Cemetery, near Washington, D.C. People from all parts of the world visit this shrine. January 19, Lee's birthday anniversary, is a legal holiday in most Southern states. Lee represents Virginia in Statuary Hall in the Capitol in Washington.

Marshall W. Fishwick

See also Civil War; Lee, Francis Lightfoot; Lee, Henry; Lee, Richard Henry.

LEE, TSUNG DAO (1926-), shared the 1957 Nobel prize in physics with Chen Ning Yang. They proposed that the "conservation of parity," a basic principle of nuclear physics, did not hold true in some cases (see Physics [Physics Today]). Lee has also concentrated on field theory, astrophysics, and hydrodynamics.

Lee was born in Shanghai, China. He was educated at Chinese universities and the University of Chicago, where he received a Ph.D. degree in 1950. Ralph E. Lapp

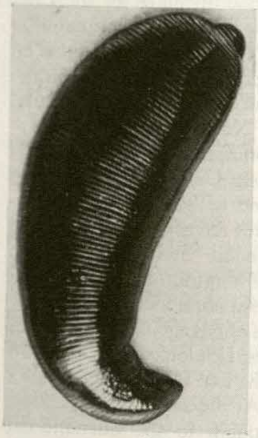
See also Nobel Prizes (picture).

LEE, WILLIAM. See Knitting Machine.

LEE-ENFIELD. See Rifle.

LEECH is a worm that is also called the *bloodsucker*. Many kinds of leeches fasten themselves to animals and suck their blood. Leeches live in many parts of the world. They are bad pests in parts of India and the East Indies. Some live in moist soil; some live in rivers, streams, and ponds; and others live in the sea. The *land leech* lives in the woods in many countries and is a pest because it attacks men and cattle.

Leeches are from ½ inch to 3 or 4 inches long. Their bodies are divided into rings or sections and they may have as many as 10 pairs of eyes. Sight is almost their only organ of sense, because they are a low form of life. Their nervous and digestive systems are simple. Both sexes are found in a single animal.


Cornelia Clarke

The Leech was once used by doctors to suck blood from patients in attempts to cure.

Leeches lay their eggs in cocoons. They leave a liquid containing albumen in the cocoon for the young to eat. The young leeches are almost full-grown before they leave the cocoon.

The leech sucks blood through a tiny disc at the head end. At the hind end is a larger disc that the leech uses for holding on to skin or other objects. The best-known leech is the one formerly used by doctors. It was considered important in the days when doctors let sick people bleed to cure them. This *medicinal leech* lives in swamps and sluggish streams. It has a mouth in the middle of the front sucking disc. The mouth has three sharp small white teeth that act as saws. The worm makes a wound with the teeth and sucks the blood from the wound with its disc.

Scientific Classification. Leeches belong to the class *Hirudinea* in the phylum *Annelida*. The land leech is *Haemadipsa*. The medicinal leech is genus *Hirudo*, species *medicinalis*.

J. A. McLeod

LEECH, MARGARET (1893-), an American writer, twice won the Pulitzer prize for history. She received the award in 1942 for *Reveille in Washington* and again in 1960 for *In the Days of McKinley*. She married Ralph Pulitzer, publisher of the *New York World*, in 1928. He died in 1939. Margaret Leech was born in Newburgh, N.Y., and was graduated from Vassar College. Her works include several novels.

LEECHEE. See Litchi.

LEEDS (pop. 508,600; met. area, including Leeds, Bradford, and suburbs, 1,100,000; alt. 245 ft.) is the center of the wool-manufacturing district of England. It lies in the north-central part of the country on the River Aire (see GREAT BRITAIN [map]). The nearby great coal fields of Yorkshire furnish cheap power for the industries of Leeds. The town is connected with the east coast by the River Aire. Canals furnish a water connection with the west coast. Leeds also has railroad connections with other English cities. Modern transportation systems have helped Leeds develop into an important industrial center. The Leeds and Liverpool Canal connects the city with Liverpool.

Leeds is the largest of a cluster of towns where the spinning and weaving of wool have been important industries since the Middle Ages. About four fifths of the woolworkers in England live in this region. Leeds is the wholesale clothing center of the country, and is noted for its leather, iron, and steel products. It is also a cultural and intellectual center for northern England.

The town is the home of the University of Leeds, which was founded in 1904. It has grown to be one of England's largest and best-known universities, with an annual enrollment of about 3,000.

Records show that the site of Leeds was inhabited as early as the 600's. Its organization was rural, and no town existed until after the Norman Conquest in 1066. The town received its first charter in 1207.

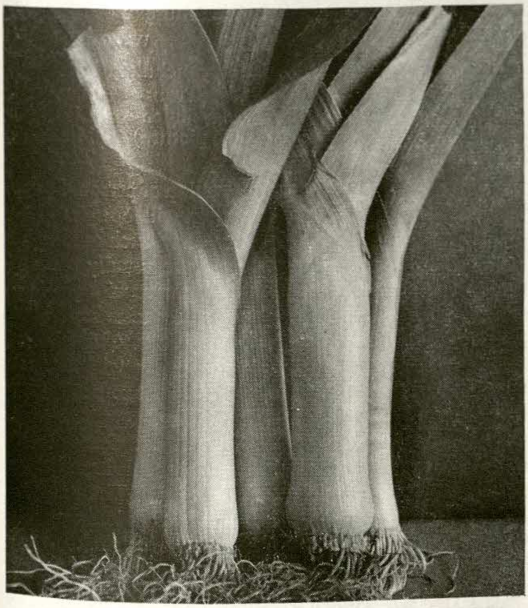
The ruins of Kirkstall Abbey, built during the 1100's, still stand in the midst of Leeds' factory district. The smokestacks and buildings of modern industry tower above the remains of the old abbey. Smoke and soot fall on what was once the peaceful green of the abbey grounds and gardens. FREDERICK G. MARCHAM

LEEK is a vegetable that resembles the onion but has a mild flavor. Unlike an onion it grows thick along the entire stem. It is related to onions, garlic, shallots, and chives. Leeks are not grown much in home gardens, and have little commercial value. The blanched stems and leaves are used as a flavoring for soups and stews, or are boiled and served like asparagus.

The Welsh like to eat them. The leek is also the national flower of Wales. Many Welshmen wear a sprig of leek on St. David's Day, March 1. Leeks are grown from seeds just as onions are. Earth is often packed around the shoots to blanch them. The crop is not ready to harvest for a full season.

The Leek Does Not Have the Strong Taste of the onion, although it looks much like it. This vegetable grows slowly.

J. Horace McFarland



Scientific Classification. The leek is in the family *Liliaceae*. It is genus *Allium*, species *porrium*. ARTHUR JOHN PRATT

See also SHALLOT.

Bausch & Lomb

Anton van Leeuwenhoek explains how he discovered bacteria and other tiny organisms with his simple microscope.

LEEUWENHOEK, *LAY vun HOOK,* **ANTON VAN** (1632-1723), a Dutch amateur scientist, revealed a new world of microscopic life through his observations, drawings, and writings. He is called "The Father of Microbiology" because he was the first in the field to leave written records of his findings.

Through tedious hand-grinding techniques, Leeuwenhoek prepared hundreds of lenses with magnifying powers up to 270 diameters (see MICROSCOPE). With these lenses, he studied such diverse materials as stagnant water, teeth scrapings, blood cells, muscle fibers, and spermatozoa. His *animalcules*, or tiny animals, were described as being 1,000 times smaller than the eye of a louse, which he used as a standard measurement because its size is remarkably constant.

While Leeuwenhoek is generally considered more of an observer than a theoretician, he opposed the popular notion that living things can arise from dead matter. Leeuwenhoek was born at Delft, The Netherlands, on Oct. 24, 1632, and died there. STANLEY E. WEDBERG

LEEWARD. See SAILING (Why a Boat Sails).

LEEWARD, *LEE word* or *LOO urd,* **ISLANDS** are a part of the West Indies Federation. The group lies southeast of Puerto Rico. It covers an area of 423 square miles and has a population of 109,000. The islands were named *Leeward* because they are sheltered from the trade winds. The name comes from the sailing term *lee*, the side of a boat that is *sheltered* from the wind.

Most of the people of the Leeward Islands work at farming or fruitgrowing. The main products are tobacco, cotton, onions, coconuts, tomatoes, and limes. The islands also produce cigars, molasses, and sugar.

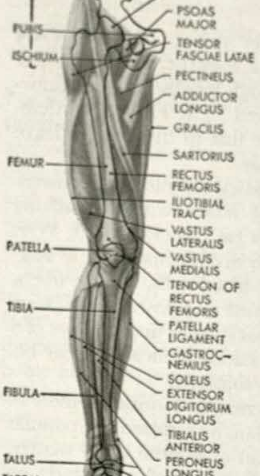
Three island groups, St. Christopher (St. Kitts)-Nevis-Anguilla; Antigua; and Montserrat, as members of the West Indies Federation, send representatives to the Federation Parliament in Trinidad, Jamaica. The British Virgin Islands, although geographically a part of the Leewards, did not choose to join the Federation. They are still a British colony.

Leeward Islands is also the name of all the islands between Puerto Rico and Dominica, including Guadeloupe and the Virgin Islands. W. L. BURN

See also BRITISH WEST INDIES; GUADELOUPE; VIRGIN ISLANDS; WEST INDIES FEDERATION; WINDWARD ISLANDS.

LEFT WING is a term which means a liberal or radical party, or branch of a political group. The term originated in the first French legislature after the French Revolution. The conservative representatives were seated to the right of the speaker, and the more radical deputies were seated to his left. Later, people throughout the world used the terms *left* and *right* to denote the two opposing political beliefs, liberalism and conservatism. Today, the left wing is often identified with socialism or communism. WILLIAM EBENSTEIN

LEG is the limb that supports the body of a human being or animal. Properly, it is only that section of the lower limb between the ankle and the knee. The part of the limb between the knee and hip is called the *thigh*. In man, the thigh contains the *femur*, the longest, strongest bone of the body. The femur meets the hipbone at the hip joint. This is a ball-and-socket joint that allows a person to move his limb freely, but also provides the stability needed to bear the weight of the body. See HIP.



Leg Muscles and Bones act together to support the body and to provide movement when a person walks or runs.

The Thigh. Muscles, attached to the bones by *tendons*, or strong cords of tissue, make it possible for a person to move his limbs. The front of the thigh consists of a four-parted muscle, the *quadriceps femoris*. This muscle allows a person to straighten his limb at the knee, and to bend the thigh at the hips. Three long muscles, called the *hamstring muscles*, allow him to bend his knee and straighten his thigh. The tendons of these muscles connect with the leg bones and can easily be felt on either side of the leg behind the knee. The quadriceps femoris and hamstring muscles of the thigh are chiefly important for walking, kicking, and climbing.

The Leg, or lower part of the limb, contains two bones. These are the *tibia*, or shinbone, which can be felt close to the middle front section of the leg, and the *fibula* in the muscles of the side of the leg.

Seven muscles make up the *calf*, or fleshy part of the back of the leg. The *gastrocnemius* is the most prominent. These muscles allow a person to bend his toes and to raise his body on the balls of his feet. The *tendo calcaneus*, or *Achilles' tendon*, connects three of the calf muscles with the heel bone. This tendon forms the prominent ridge on the back of the leg, extending upward from the heel to the lower calf. Four muscles on the front of the leg bend the foot upward and straighten the toes. Two additional muscles near the fibula bend the foot sideways.

The Knee Joint, formed between the femur and the tibia, acts like a hinge. But it also allows a little movement from side to side. The *patella*, or kneecap, is a shield-shaped bone located in front of the knee joint. It acts as a pulley for the tendon of the quadriceps femoris muscle. Only human beings, other mammals, and birds have kneecaps.

Blood and Nerve Supply. The *femoral artery* is the main artery that carries blood to the lower leg. It runs down the front of the thigh, then travels behind the knee, where it becomes the *popliteal* artery. Finally, it branches to form the arteries of the leg. The largest nerve of the entire body, the *sciatic* nerve, extends down the back of the thigh to the leg and foot. It supplies the nerves for the skin of the foot and most of the leg, as well as those for all of the muscles of the foot and leg. It also supplies the nerves for the muscles of the back of the thigh. WILLIAM V. MAYER

Related Articles in WORLD BOOK include:

Achilles' Tendon
Ankle
Bone
Foot
Human Body (Trans-Vision three-dimensional color picture)
Joint
Kneecap
Ligament
Muscle
Tendon

LEGACY, *LEG uh sih*, is a disposition of personal property which is made by the terms of a will. *Specific legacies* are gifts of particular pieces of property, such as jewelry, books, or clothing. *General legacies* are usually sums of money. *Residual legacies* are what remains of a person's estate after the specific and general legacies have been paid. For instance, a man leaves bequests to his friends, servants, and relatives, and states in his will that his residual legacy, or the rest of his estate, is to be divided between his wife and son (see WILL).

Before any legacies are given out, the debts of the dead person must be paid. Next, the specific legacies are paid out, and then the general legacies. The residual legatees divide what remains. If a man has less property or more debts when he dies than he had when he made his will, he may leave nothing to those whom he wanted to have the bulk of his estate. WILLIAM TUCKER DEAN

LEGAL HOLIDAY. See HOLIDAY.

LEGAL TENDER is any type of money that is a legal offer for payment of a debt. By act of Congress on June 5, 1933, all kinds of money issued by the authority or under the authority of the United States became full legal tender for all debts public and private.

Before this act was passed, gold coins, gold certificates, United States notes (greenbacks), silver dollars, and treasury notes of 1890 had full legal-tender power. But silver certificates, national bank notes, Federal Reserve bank notes, and Federal Reserve notes did not. Smaller coins such as silver half dollars, quarters, and dimes were legal tender up to the amount of $10. Nickels and pennies were legal tender up to 25 cents. Gold ceased to be legal tender following a number of acts such as the Gold Embargo, the antihoarding proclamation of 1933, and the act of January 30, 1934. These acts made illegal the possession of gold coins or bullion for use in monetary exchange in the United States.

Canadian Legal Tender. Under the Canadian Currency Act, a legal tender may be made in copper coins up to the amount of 25 cents. Canadian silver coins may be tender up to the value of $10. Canadian notes are legal tender for any amount. The British sovereign was legal tender for the amount of $4.86 until Great Britain went off the gold standard in 1931. FREDERICK A. BRADFORD

See also MONEY.

LE GALLIENNE, *luh gal YEN,* is the family name of a poet and an actress, father and daughter.

Richard Le Gallienne (1866-1947) was an English poet of French descent. After working several years as an accountant, he took an interest in literature and became a leading member of the London literary group in the 1890's. He wrote many volumes of verse, including *English Poems* (1892) and *October Vagabonds* (1910). Among his most lasting works are a novel, *The Quest for the Golden Girl* (1896), and his memoir, *The Romantic Nineties* (1926). Richard Le Gallienne was born and educated in Liverpool. HARRY T. MOORE

Vandamm

Eva Le Gallienne

Eva Le Gallienne (1899-) founded and directed the Civic Repertory Theatre in New York City. From 1926 to 1932, this theater group performed outstanding plays at low admission prices. As an actress, Miss Le Gallienne gained her first major success in *Liliom* in 1921. She also had leading parts in *The Inheritors* and *Thérèse*. Her later triumphs included roles in *Camille*, *The Master Builder*, *Uncle Harry*, and *Mary Stuart*. She was born in London. MARY VIRGINIA HEINLEIN

LEGATE, *LEG it,* is a special envoy of the pope. In early times, legates represented the pope at church councils. Later the popes sent legates to the courts of England, France, and Hungary. There the legates began to have a place in international affairs. They appealed to governments of the world to protect noncombatants in time of war. In the name of the church, they asked that fighting on the Sabbath be forbidden. In many ways, legates set the beginnings of international law.

There are now three grades of legates: the pope's special representatives, permanent representatives at foreign capitals, and certain archbishops. Only cardinals can be special representatives. PAYSON S. WILD, JR.

LEGATION. A diplomatic minister and his assistants make up a legation. Powerful nations generally set up legations, rather than embassies, in countries of minor importance. According to international custom, a minister ranks below an ambassador.

See also AMBASSADOR; DIPLOMACY; MINISTER.

LEGEND. See MAP (Symbols).

LEGEND, *LEHJ und,* originally meant a story intended to be read in churches. The term comes from the Low Latin word *legenda,* meaning *a story to be read.* The early legends dealt with holy persons, so legends came to mean especially the lives of saints. The most famous collection of legends of the saints is the *Golden Legend,* compiled about 750 years ago.

The term legend is now often used to mean an improbable, fanciful story handed down from the past by word-of-mouth. Legendary tales are interwoven with the history of all peoples. Examples are the stories of the earliest kings of Rome, the Swiss legend of William Tell, and the British stories of King Arthur.

For a list of books on Legends, see STORYTELLING (Hero Tales and Legends). See also the LITERATURE section of the READING AND STUDY GUIDE under the heading Mythology, Folklore, and Legend.

LEGENDRE, *luh ZHAHN dr',* **ADRIEN MARIE** (1752-1833), a French mathematician, influenced the teaching of geometry in America. He wrote *Elements of Geometry* (1794), which was published in the United States in 1819. It made considerable use of numbers and of algebra, unlike the traditional geometry book. He also helped set up the metric system, and worked on the theory of numbers, elliptic functions, differential equations, and trigonometric tables (see METRIC SYSTEM). Legendre was born in Toulouse, France. PHILLIP S. JONES

Robert Doisneau

Fernand Léger

LÉGER, FERNAND (1881-1955), a French painter, was one of the important artists of the 1900's. Like his contemporaries, Georges Braque and Pablo Picasso, both of whom gained fame, Léger belonged to the Cubist movement. But Léger developed a highly individual style. His paintings feature bright clear colors, accented by strong black. Although his works are mainly abstract in design, the natural appearance of objects and persons is traceable in them. His *Man in the City* appears in color in the PAINTING article. Léger was born in Argentan, France. JOSEPH C. SLOANE

LÉGER, *LAY zhay,* **PAUL-ÉMILE CARDINAL** (1904-), became archbishop of Montreal, Can., in 1950. He was raised to the rank of cardinal in 1953. Léger was born in Valleyfield, Que. He served as vicar-general of the diocese of Valleyfield from 1940 to 1947, and as rector of the Canadian College in Rome, Italy, from 1947 to 1950.

LEGHORN, in Italian, Livorno, *lee VOR noh* (pop. 152,700), ranks next to Genoa and Naples as a busy seaport in Italy. It lies on the Ligurian Sea, about 60 miles southwest of Florence. For location, see ITALY (color map). It is an important industrial city, with steelworks, glass factories, and automobile plants. Leghorn hats, made from wheat straw, and coral ornaments are exported. Other exports include marble, olive oil, boracic acid, silk, and wine. Leghorn resembles Venice in that it has many canals.

The most interesting of its public buildings include the cathedral, a Jewish synagogue, the Academy of Sciences, and the naval academy. "The Tower of the Sculptured Lion," a leading landmark, is a relic of the days when the city was a free port.

Leghorn was a little fishing village when the Florentines took it in 1421. It has grown steadily in importance and prosperity. The sulfur springs and sea bathing attract many visitors. SHEPARD B. CLOUGH

LEGHORN. See CHICKEN (Mediterranean Class).

LEGION was a division of the Roman army. It varied in size at different periods, but usually consisted of 4,000 to 6,000 soldiers. The legion differed from other army units, both in the way the men were drawn up for battle and in the fighting methods they used.

The legion advanced against the enemy in three lines. Each line was divided into 10 units called *maniples*. Each maniple was 10 men wide and 6 or 12 men deep. The units were arranged in such a way that the men had room to move and to fight. The men of the first two lines hurled heavy javelins and used swords for hand-to-hand fighting. The third line was made up of experienced soldiers who used long spears called *pikes* in the fighting.

The Romans fought their chief enemies with this formation. These foes used the Macedonian phalanx, made up of spearmen. The soldiers of the phalanx advanced into battle in a thick body like a moving wall of spear points. The phalanx needed good level ground, but the legion could operate in a battle on any type of field.

When Gaius Marius led the Roman army, the legion was made up of 10 *cohorts* of infantry. Each cohort had about 600 soldiers. The cohort was divided into three maniples, and each maniple into two *centuries* of about a hundred men each. The legion was led by 6 military tribunes (colonels), and by 60 *centurions* (captains). The standard bearers carried the Roman eagle, the standard of the legion. WILLIAM SCOTT FERGUSON

See also ROMAN EMPIRE (color picture, The Roman Army).

LEGION, AMERICAN. See AMERICAN LEGION.

LEGION, FOREIGN. See FOREIGN LEGION.

LEGION OF HONOR. See DECORATIONS AND MEDALS (France); KNIGHTHOOD, ORDERS OF.

LEGION OF MERIT. See DECORATIONS AND MEDALS (Decorations of the United States).

LEGISLATIVE ASSEMBLY. See FRENCH REVOLUTION (The Legislative Assembly).

LEGISLATIVE DEPARTMENT OF THE UNITED STATES GOVERNMENT. See CONGRESS OF THE UNITED STATES; HOUSE OF REPRESENTATIVES; SENATE; UNITED STATES CONSTITUTION (Article I).

LEGISLATURE, *LEHJ ihs LAY chur*, is the lawmaking branch of a government. In the United States, the national legislature is called the *Congress*. In Great Britain and Canada, it is the *Parliament*. In Russia, it is the *Supreme Council of the U.S.S.R.* Most legislatures have the power to pass laws, or statutes, which all citizens must obey. Sometimes legislatures have greater authority than the executive head of a government, and can supervise and regulate his activities.

In parliamentary forms of government, as in Great Britain and Canada, the legislature determines the appointment of the prime minister and his cabinet. The ministry can remain in office only so long as it has the support of a majority in the legislature. In presidential systems, as in the United States, the chief executive is elected for a definite number of years. He holds office for that length of time even though he may not have the support of a majority in the legislature.

Most legislatures today are divided into two separate groups, called houses or chambers. A legislature of two chambers is called a *bicameral* legislature. In the United States these two chambers are the *Senate* and the *House of Representatives*. In Great Britain they are the *House of Lords* and the *House of Commons*. In Canada, they are the *Senate* and the *House of Commons*. In most two-house legislatures, both houses must approve a bill before it becomes a law. But in Great Britain only the approval of the House of Commons is necessary to pass any law relating to money matters.

The legislature in many states of the United States is called the general assembly. Most general assemblies resemble the national legislature in organization and method of operating. In 1934, Nebraska abolished its two-house assembly and adopted a one-house legislative body. A one-house body is known as a *unicameral* legislature. Many persons believe that unicameral legislatures function more quickly and efficiently than bicameral bodies.

Most national legislatures hold a regular session each year. Special sessions may be called to meet problems that come up between the regular sessions. In the United States, only six state legislatures hold yearly sessions. The other states of the Union meet every two years. But any of these state legislatures may be called into special session when the need arises.

The members of legislatures are elected to office for a varying number of years. Members of the United States Senate are elected to office for terms of six years, and members of the House of Representatives for two years. Members of some of the state senates are elected to office for terms of four years, and the representatives (called assemblymen in some states) for two years. In other states, both senators and representatives are elected for two years. In two states, both houses of the legislatures are elected for four-year terms.

In cities, the legislature is usually called the *board of aldermen*, *common council*, or *city council*. Sometimes it is called the *commission*. Laws passed by city legislatures are usually called *ordinances*. PAYSON S. WILD, JR.

Related Articles in WORLD BOOK include:

Address, Form of
Alderman
Amendment
Assembly
Ballot
Bill
City and Local Governments
Committee of the Whole
Congress of the United States
Delegate

Diet
Duma
Enabling Act
House of Burgesses
House of Commons
House of Lords
House of Representatives
Initiative and
  Referendum
Junta
Law
Lobbying
Local Option
Mace
Omnibus Bill

Parliament
Parliamentary Law
Pork Barrel
Proportional
  Representation
Quorum
Reichstag
Repeal
Senate
Sergeant at Arms
Speaker
Statute
United States Constitution
  (Article 1)
Veto

LEGUÍA Y SALCEDO, AUGUSTO B. See PERU (The 1900's).

LEGUME FAMILY, *LEG yoom,* or **PEA FAMILY,** is probably the second largest family of flowering plants. The composite family is the largest (see COMPOSITE FAMILY). Botanists recognize about 13,000 *species*, or kinds, of legumes. The family gets its name from the *legumes*, or seed pods, which most of the plants bear.

Many plants of the legume family are of great economic importance throughout the world. Peas, beans, and peanuts are valuable foods. Alfalfa, clover, and vetch are important forage and pasture plants. Other kinds of leguminous plants yield medicines, dyes, oils, and timber.

Legumes grow in most parts of the world. They vary widely and may be trees, shrubs, or herbs. Many are climbing plants. The flowers of one large subfamily of legumes look like butterflies. Botanists call this group *Papilionoideae*, from the Latin word for *butterfly*. The common sweet pea belongs to this group. The flowers of other legumes may be small and regular. Still others may be irregular, with spreading petals.

Legumes take nitrogen into their roots from the air. Certain bacteria live in *nodules*, or knotlike growths, that form along the roots of the plants. These bacteria take nitrogen from the air and change it into forms that can be used by plants. This characteristic makes leguminous plants valuable in agriculture. Farmers often use them as green manure and as cover crops to improve poor soil (see NITROGEN).

Many plants of the legume family have separate articles in WORLD BOOK. For a list of these plants, see FLOWER (table, Families [Bean]).

Scientific Classification. Legumes belong to the order *Rosales*. They make up the legume, pea, pulse, or bean family, *Leguminosae*. JULIAN A. STEYERMARK

LEHÁR, *LEH hahr,* **FRANZ** (1870-1948), was a Hungarian composer of light operas. He began his career by following in his father's footsteps as a violinist, bandsman, and conductor. The composer Antonín Dvořák encouraged him to write music. Lehár's most successful operetta was *The Merry Widow* (1905), with its lilting "Merry Widow Waltz." He also wrote the highly popular operettas *The Count of Luxembourg* (1909), *Eva* (1911), *The Land of Smiles* (1923), *Clodo* (1924), and *Paganini* (1925). Lehár was born in Komárom, Hungary. JOYCE MICHELL

LE HAVRE, *luh AH vr'* (pop. 139,810; met. area, 195,000), is second only to Marseille as a French port. It lies at the mouth of the Seine River on the Channel coast of France. For location, see FRANCE (color map). Railroads and inland waterways link Le Havre with Paris and the interior of France. Le Havre's broad, well-fortified harbor can hold as many as 300 ships, and foreign trade is an important part of the city's industry. Factories refine oil and produce machinery, cotton goods, chemicals, sugar, and munitions.

The Germans captured the city and port early in World War II, and the Allies freed Le Havre in 1944. Much of the city was destroyed during the war, but it has been rebuilt with a new harbor. EDWARD W. FOX

LEHI, *LEE high.* According to the *Book of Mormon*, Lehi, Ishmael, and their two families were led from Jerusalem by divine command to the west coast of America in 600 B.C. Here they founded a colony. But, after Lehi's death, rebellion separated the colony and it grew into two nations, the Nephites and Lamanites. About A.D. 400, the Lamanites destroyed the Nephites. Mormons believe that the Indians of America are descendants of these Lamanites.

LEHIGH RIVER, in Pennsylvania, is an important route for shipments from the coal and iron fields in the river valley. The Lehigh rises in northeastern Pennsylvania near Wilkes-Barre. It winds for 120 miles and empties into the Delaware River at Easton. The Lehigh has a system of locks and dams.

LEHIGH UNIVERSITY is a privately controlled, nonsectarian school for men at Bethlehem, Pa. Women are admitted to graduate study. The university consists of the Colleges of Arts and Science, Business Administration, and Engineering; as well as the Graduate School and Institute of Research. Interrelationship between the colleges is stressed, so that students in the humanities will be acquainted with the exact sciences, and engineering students with the offerings of arts and science. The university grants the A.B. degree, various B.S. degrees, and M.A., M.B.A., and Ph.D. degrees. ROTC and AFROTC units are on campus. Lehigh was founded in 1865. For enrollment, see UNIVERSITIES (table). ROBERT F. HERRICK

LEHMAN, HERBERT HENRY. See NEW YORK (Famous New Yorkers).

LEHMAN CAVES NATIONAL MONUMENT, in eastern Nevada, has limestone caverns of great beauty and scientific interest. The 640-acre monument was established in 1922.

LEHMANN, LILLI (1848-1929), was a German soprano. She made her debut in 1865, and later became a leading member of the Berlin Royal Opera. In 1876, she sang in the first production of Richard Wagner's *Nibelungen Ring* at Bayreuth, Germany. She joined the Metropolitan Opera Company of New York City in 1885, and appeared in a variety of coloratura and dramatic roles. She became famous as a singer of German art songs, and as a teacher. She was born at Würzburg, Germany. SCOTT GOLDTHWAITE

Lilli Lehmann

Culver

LEISURE, *LEE zhur,* is the time a person has after he completes his work and other essential tasks. He can use this leisure time as he pleases. He may play or study, travel about the country or relax at home, build a hi-fi set or a cabinet, and work in a community project or take part in local politics.

Leisure time is a comparatively recent development in human society. For hundreds of years, men, women, and children worked for endlessly long hours. They had no time left for play and relaxation. They did their work by hand and, later, with simple machines in a slow, time-consuming process.

A new way of working developed with the invention of modern machinery. This change, called the *Industrial Revolution,* brought about new methods of work and living. In the past, workmen had made a product from beginning to end. But with new machine techniques, workers merely made pieces of products. For example, in making shoes, one person would cut the leather, another would sew only the upper parts, another would cut the soles, and another would sew the sides to the soles. Such mass-production techniques enabled workers to complete the same amount of work in much less time.

New Way of Life. In the early 1900's, labor unions and social legislation in the United States brought about shorter working days. By the 1930's, working hours had decreased until now most people work an eight-hour day and a five-day week. For the first time in history, people found time for leisure and following their personal interests outside of their jobs.

Laborsaving devices have brought about many changes in the home. Because of modern appliances, central heating, and modern plumbing, many housewives have more leisure time than before. The farmer has cultivators, harvesters, milking machines, and scores of other farm equipment to make his labor easier and his working day shorter. All these changes add up to a higher standard of living. Because of advances in medicine, persons live longer and can retire on pensions. Social security laws make it easier for many persons over 65 to retire and engage in leisure-time activities. In industry, the trend is toward increased vacation time. In the past, one week of vacation a year was considered ample time. Today, many persons receive two- and three-week paid vacations. This time gives workers the opportunity to do some of the things they have always wanted to do. In the past, only the wealthy had the time and money to travel. Today, many workers with average incomes travel two or three weeks of every year. Skiing and boating no longer are considered a rich man's sports. Many others now have the time and money to engage in these sports. Golf, swimming, tennis, and gardening have become part of our leisure-time living. Today, these activities are available to many.

Education. In addition to allowing time for sports and informal living, leisure time has brought an increase in adult education. Many adults attend school in their leisure time. They go to school to finish education that may have been interrupted in the past, to get higher degrees, or merely to study subjects that interest them. Aside from the courses in formal education, local schools, recreation boards, churches, and community centers conduct classes in such subjects as dancing, woodworking, music, arts and crafts, and sewing. They also promote discussion groups on many topics. Public libraries sponsor discussion groups that encourage reading.

Because of leisure-time activities and the way in which they have become part of our lives, a new field has developed in social work. Schools of social work and recreation in colleges and universities train personnel to help persons develop through leisure-time activities. These fields are called *group work* and *recreation,* and are followed professionally by many social agencies.

The How-to-Do-It Movement has become a large and growing one. As more and more families move into suburban areas and own their own homes, they find themselves doing more things themselves. The space that homeowners have in basements, workshops, and recreation rooms has made it possible for many of them to join the do-it-yourself trend. Many do their own home repairs, build their own furniture and garages, and do their own decorating and gardening. The father has more time to spend with his children and to work with them in such hobbies as making models of cars, airplanes, boats, or trains. With extra time, there is also more opportunity to help others. Volunteer workers spend much time in hospitals, nurseries, homes for the aged, and in assisting in other community institutions. People have developed a greater interest in civic affairs. Many have joined groups that try to bring about vital changes in local policies.

Effect on Business and Industry. Increased leisure time has enabled business and industry to expand and increase their sales greatly. Newspaper and periodical advertising reflects the thousands of products that have been placed on the market for leisure-time pursuits. Sporting goods concerns take in millions of dollars every year. Because people have more time for reading, the publishing field has expanded. Manufacturers make it easy for the hobbyist to pursue his interests. They make kits of pre-cut patterns complete to the last nail. All the hobbyist has to do is assemble the project and put on the finishing touches. These manufactured kits have brought a new retail business, the hobby shop. Experts who work in such shops advise hobbyists on the best types of leather, wood, paint, varnish, or other materials to use on a particular project.

Families spend much leisure time together. They engage in such group amusements as picnicking and camping. The drive-in theater has become an amusement center for the whole family. Travel by automobile and public transportation has become a big factor in leisure time. This activity has increased the business of gasoline stations and travel agencies. Americans have learned to enjoy themselves and to know their country as well as other countries. Leisure-time activity has helped to broaden their lives. LILLIAN FRANKEL

Related Articles in WORLD BOOK include:

Amusements
Card Game
Game
Hobby
Play
Recreation
Sports and Sportsmanship
Storytelling
Vacation

LEITER, LEVI ZEIGLER. See FIELD (Marshall Field I).

LEJEUNE, CAMP. See CAMP LEJEUNE.

LELAND, HENRY M. See AUTOMOBILE (Assembly Line Production).

L'ÉLYSÉE, PALAIS DE. See PARIS (Famous Buildings).

LÉMAN, LAC. See LAKE GENEVA.

LEMAY, CURTIS EMERSON (1906-), commanded the Strategic Air Command of the United States Air Force from 1948 to 1957. During a period in which American foreign policy depended heavily upon the striking power of the Strategic Air Command's long-range bombers, LeMay became one of America's most famous airmen. In 1957, he became Vice Chief of Staff of the Air Force. In 1961, he was named Air Force Chief of Staff

LeMay was born in Columbus, Ohio, and was graduated from Ohio State University. He enlisted as a flying cadet in the Army Air Corps in 1928. During World War II, he won attention as a bomber commander in Europe. In 1943 he commanded the Third Bombardment Division of the Eighth Air Force. In September, 1944, he took command of the 20th Bomber Command.

When the Pacific islands of Guam and Saipan became the main bases for the growing B-29 offensive against Japan, LeMay took charge as the commander of the 21st Bomber Command. From January, 1945, until the end of the war, he directed an air assault of mounting intensity against Japan. WESLEY FRANK CRAVEN

Wide World

Curtis E. LeMay

Basil Zarov, Montreal

Roger Lemelin

LEMBERG. See LVOV.

LEMELIN, ROGER (1919-), a Canadian novelist, became famous for his witty but accurate and sympathetic stories of French-Canadian family life. In 1936, he was injured in a ski-jumping accident. During his recovery, he wrote his first novel, published in English translation as *The Town Below* (1945). The book enjoyed immediate success. *The Plouffe Family* (1948) formed the basis of a well-known Canadian television series. In 1952, Lemelin published *In Quest of Splendor*. He was born in the city of Quebec. DESMOND PACEY

LEMMING, *LEHM ing*, is a small animal related to the mouse. The best-known lemmings live in Scandinavia. The yellowish-brown, spotted bodies of these lemmings are about 5 inches long.

Every 5 to 20 years, hordes of lemmings leave their homes in the Scandinavian mountains. They travel west toward the Atlantic Ocean or east toward the Gulf of Bothnia. When the lemmings reach the sea, they plunge in and drown. No one really knows why these animals kill themselves.

Scientific Classification. Lemmings belong to the family *Muridae*. The Scandinavian lemming is genus *Lemmus*, species *lemmus*. STANLEY P. YOUNG

See also ANIMAL (color picture, Arctic Lands and Seas [Collared Lemming]).

LEMNOS. See AEGEAN SEA.

LEMON is a small, yellow, oval-shaped citrus fruit. The lemon tree is native to southeastern Asia, but it is grown commercially chiefly in the countries around the Mediterranean Sea and in southern California. The tree is a small evergreen with spreading branches that give it an irregular shape. It is covered with short, stout spines. It has long, pointed, pale green leaves and large, fragrant flowers that grow singly or in clusters. The buds are tinted reddish-purple, but the inside surfaces of the petals are white.

Botanists call the lemon fruit a *hesperidium*, which is a special kind of many-celled berry, typical of the citrus family. It is covered with a yellow skin dotted with tiny glands that look like pores. These glands contain oils. A thick, spongy membrane lines the skin. It encloses 6 to 8 segments that contain the pulp, juice, and seeds. Lemons have only a few quite small seeds, or often none at all. The juice is usually quite tart, but some kinds of lemons have sweet juice. Lemon juice is rich in vitamins A, B, and C, and in mineral salts.

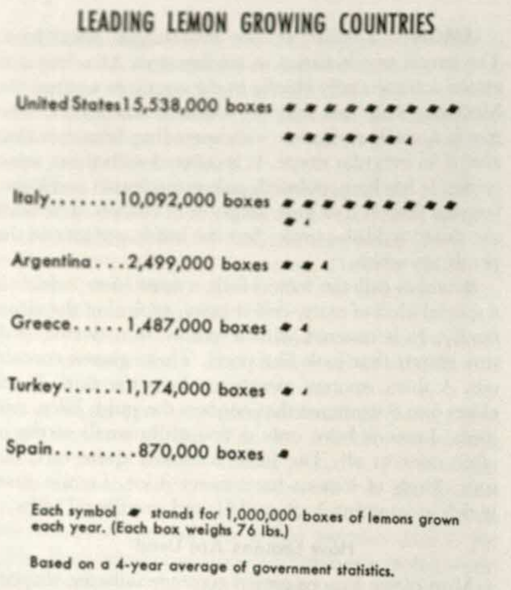
How Lemons Are Used

Most of the lemons grown commercially are shipped as fruit, but some are used to make other things. Manufacturers extract citric acid from lemons and convert it into a white, crystalline powder. They use the powder as a base for carbonated beverages, as a laxative in medicines, and as a flavoring in baked goods.

The fresh fruit and the juice are widely used in beverages, cooking, candies, and for toilet preparations. The oil is used for flavorings and for making perfumes.

The Lemon, *right,* has a light-yellow skin dotted with tiny pores. Lemon flower petals are white on top and tinged with purple underneath. The lemon tree, *below,* blooms and produces fruit almost continuously in certain climates.

Sunkist; J. Horace McFarland



Stores also sell both bottled or frozen lemon juice.

Pectin, a white, grainy powder, is made from lemon skins and membranes. This substance occurs in most fruits, but is available in large quantities in lemons. Manufacturers use it as a starting substance to make commercial pectins. During World War II, lemon pectin powder was sometimes used by soldiers, who sprinkled it in wounds to help blood clots form. See PECTIN.

Wartime research provided many other uses for lemons. For example, researchers found that paper sprayed with a substance made from lemon pulp resisted oil. Cartons made of paper sprayed with this substance would hold gasoline for months, freeing metal for more important uses.

How Lemons Are Grown

Cultivation. The lemon tree thrives in tropical and subtropical climates. It is grown commercially only in dry countries, because summer rainfall often causes diseases of the rind of the fruit. The trees also must be protected from frost. Almost all California lemon growers use orchard heating. Both trees and fruit are affected by sudden heat and wind, and many growers protect the trees with windbreaks.

Growers raise lemon trees by grafting buds to seedling rootstocks of other kinds of citrus fruits. The sweet orange rootstock is used most commonly in California. Some growers use the grapefruit or the rough lemon, a relative of the lemon. The fruit of the rough lemon has no value, but the rootstock is quite hardy.

Lemon trees bloom and produce fruit almost continuously in the right climate and with proper care. They bear most fruit during winter and in early summer.

Growers plant the trees in good, well-drained soil. They do not need much water. Trees that get too much water grow quickly, but produce less fruit. Overirrigation may kill the trees. Growers control destructive insects by spraying or fumigating the trees with hydrogen cyanide gas and with other poisonous preparations.

Harvesting Lemons. Lemons must be picked by hand. Pickers use a metal ring to determine the size of the fruit. They pass each fruit through the metal ring. They pick only those that are $2\frac{1}{4}$ inches or more in diameter. Smaller fruits are left on the tree until they grow larger. Workers pick the green fruits. The lemons ripen in special curing houses where temperature and humidity are strictly controlled.

Scientific Classification. The lemon tree belongs to the rue family, *Rutaceae*. It is classified as genus *Citrus*, species *limonia*.

ROBERT WILLARD HODGSON

See also CITRIC ACID; CITRUS.

LEMON LILY. See FLOWER (color picture, Summer Garden Flowers).

LE MOYNE, CHARLES (1626-1685), a Canadian colonist, founded the city of Longueuil. He was the first of a large family of French-Canadian heroes. Le Moyne left France in 1641. In Canada, he lived first at a Jesuit mission to the Huron Indians, where he learned several Indian dialects. Later, he became a fur trader, farmer, and soldier. The French government honored him with many titles, including that of *Sieur de Longueuil*, and gave him large grants of land. Le Moyne encouraged many Frenchmen to settle on these lands, and helped them during their pioneer years. He was born in Dieppe, France, and was married to Catherine Thierry-Primot.

Seven of Le Moyne's sons won fame fighting for France. Two sons, Sieur d'Iberville and Sieur de Bienville, explored the gulf regions of the Mississippi River and discovered the river mouth. They claimed the land for France. Sieur d'Iberville served as governor-general of the region and, upon his death, Sieur de Bienville succeeded him. Sieur de Bienville founded the city of New Orleans in 1718.

HOWARD R. LAMAR

Historical Pictures Service

Charles Le Moyne

LE MOYNE, JEAN BAPTISTE. See BIENVILLE, SIEUR DE.

LE MOYNE COLLEGE is a coeducational liberal arts college at Memphis, Tenn. Founded in 1871, it is affiliated with the Congregational Christian Churches. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LEMOYNE COLLEGE is a coeducational liberal arts school in Syracuse, N.Y. It is conducted by the Jesuits of the Roman Catholic Church. Courses in classics, business, education, mathematics, and industrial relations, and premedicine and prelaw courses, lead to B.A. and B.S. degrees. LeMoyne was founded by the Jesuits in 1946. For enrollment, see UNIVERSITIES AND COLLEGES (table).

ROBERT F. GREWEN

LEMUR, *LEE mur*, is one of a group of small animals related to the monkey. True lemurs live in Madagascar (Malagasy Republic) and nearby islands, but a group of animals in Africa and India are also called lemurs.

The word *lemur* means *ghost*. The animal was given this name because of its unusual appearance, its queer movements, and its strange cry. Some grunt, and others make a wailing sound. The true lemur is a lower form

New York Zoological Society

The Ruffed Lemur Has the Sharp Nose of a Fox, but its body resembles that of a monkey. Its strong black and white markings give it a ghostly appearance in the trees at night.

of life than the monkey. It has soft fur and a long, bushy tail. Its head is round with set-in eyes.

The lemur lives in trees and eats fruits, insects, small birds, eggs, reptiles, and other small forms of life. The best known lemurs are the *ring-tailed*, the *ruffed*, the *mouse lemur*, and the *indri*. The ring-tailed is gray with black and white rings around its tail. The ruffed is one of the largest lemurs. The mouse lemur grows to about the size of a rat. The indri is black with white legs. Scientists do not classify the *flying lemur*, or *colugo*, as a true lemur.

Scientific Classification. Lemurs belong to the family *Lemuridae*. The ring-tailed is genus *Lemur*, species *catta*. The ruffed is *L. varius;* the mouse is *Cheirogaleus murinus;* the indri is *Indris indris*. W. M. MANN

See also AYE-AYE; LORIS; POTTO.

LENA RIVER is the chief waterway of a large district of eastern Siberia. This district includes some of the richest gold fields in the world. The river rises on the slopes of the Baikal Mountains and flows northeast for 2,645 miles. The Lena empties into the Arctic Ocean through the Laptev Sea. The delta of the Lena is about 250 miles wide. The river drains an area of about a million square miles, which is nearly one third the size of Canada. The chief branches of the Lena are the Vitim, Olekma, Aldan, and Vilyuy rivers. Ships can sail up the Lena for about 2,000 miles.

Along its middle course, the Lena River flows through a region that is inhabited by the Yakuts, a Turkish people. The Yakuts make their living by fishing, farming, and raising livestock. The largest city on the river is Yakutsk. THEODORE SHABAD

See also RIVER (color picture, Longest Rivers).

LE NAIN, LOUIS (1593-1648), painted realistic scenes of peasant life in France. His paintings are thoughtful descriptions of peasant faces and costumes of the time. The lighting of the outdoor scenes suggests that he painted the people in his studio and then painted in the landscape background. His painting, *Peasant Family in an Interior*, appears in color in the PAINTING article. His two brothers, Antoine (1588-1648) and Mathieu (1607-1677?), also painted peasant scenes. All three were born in Laon, France. JOSEPH C. SLOANE

LENAPE. See DELAWARE INDIANS.

LEND-LEASE was a plan developed by the United States early in World War II to aid the countries which were then fighting the Axis powers. The Lend-Lease Act became law on March 11, 1941. It provided that the president of the United States could transfer weapons, food, or equipment to any nation whose fight against the Axis aided in the defense of the United States. President Franklin D. Roosevelt described the act as helping to put out the fire in your neighbor's house *before* your own house caught fire and burned down.

Under Lend-Lease, billions of dollars worth of American supplies were transferred to Great Britain, China, and Russia. Each of these nations was considered to be fighting in the defense of the United States as well as in its own defense.

After World War II, no terms were decided upon for the return of goods by countries that received United States equipment under the Lend-Lease Act. Some countries, especially Great Britain, had already balanced part of the account by furnishing goods and services to United States troops.

Many people felt that to accept a return of the goods that had been lent would injure American producers. Some authorities pointed out that all nations fighting the Axis Powers contributed everything they could to the final defeat of the enemy. They argued that American Lend-Lease contributions were balanced by the sacrifices of the other Allies. ROBERT D. PATTON

Culver

Pierre Charles L'Enfant

L'ENFANT, *LAHN FAHN*, **PIERRE CHARLES** (1754-1825), a French engineer and architect, became the first modern city planner. In 1791, he was commissioned to prepare a plan for the new United States capital city in the District of Columbia. His plan envisioned a city of wide, radiating streets; parks; and impressive public buildings. L'Enfants' headstrong temperament soon led him into a disagreement with President George Washington, and L'Enfant was dismissed as engineer-in-charge in 1793. But his plan was retained and formed the basis for the later development of Washington, D.C.

L'Enfant was born and educated in Paris. He came to America in 1777, and served as an engineering officer in the Revolutionary War. He designed the new Federal Hall in New York City as the first United States Capitol. President Washington was inaugurated on its balcony in 1789. L'Enfant spent the later years of his life trying to obtain greater compensation for his work at Washington, D.C. In 1909, Congress erected a monument to L'Enfant in Arlington National Cemetery, where he is buried. ROBERT W. ABBETT

See also FEDERAL HALL; WASHINGTON, D.C.

LENGTH. See DISTANCE; WEIGHTS AND MEASURES (Linear Measure).

LENI-LENAPE, or **LENNI-LENAPE.** See DELAWARE INDIANS.

Lenin, *above,* was the founder of Soviet Russia. The Lenin-Stalin *Mausoleum, right,* faces the famous Red Square in Moscow. The shrine formerly was known as Lenin's Tomb. Stalin's name was added to the mausoleum after his burial in 1953.

Sovfoto

LENIN, *LEN in* (1870-1924), also called Nikolai Lenin, was the leader of the Communist movement in Russia and the founder of the Soviet Union. A fanatical believer in the communist doctrine of Karl Marx, he spread it throughout Russia and tried to put it into practice.

Early Life. Lenin's real name was Vladimir Ilich Ulyanov. He was born at Simbirsk (now Ulyanovsk) on the Volga River. His father was a primary-school inspector in the service of the czar. His mother was a doctor's daughter. In 1887, Alexander Ulyanov, Lenin's elder brother, was hanged for taking part in a plot against the czar's life. This, perhaps more than anything else, made young Lenin a revolutionary.

After graduation from the Simbirsk high school, he entered Kazan University, but was expelled for political activity. Later, he was allowed to go to Saint Petersburg (now Leningrad) to take his law school examinations. He was admitted to the bar in 1891, but never seriously practiced law. Instead, he became a full-time revolutionary agitator.

Lenin was arrested in 1895 and exiled from Saint Petersburg to Siberia. When freed in 1900, he went abroad, where he became a leader of the Russian Social Democrat party. At first in Munich, and later in London, he and his friends published *Iskra (The Spark).* This revolutionary newspaper was smuggled into Russia, and gained much influence among intellectuals and workers. In 1903, at a meeting in London, the party split into two factions. Lenin led the Bolshevik, or radical, faction of the party against the Mensheviks, or moderate group (see Bolshevik; Menshevik).

Revolutionary Leader. The revolution of 1905 brought Lenin back to Russia. He called for a dictatorship of the working class, with his Bolshevik faction at its head. But the armed revolt in Moscow in December, 1905, failed. Lenin again left for western Europe. Until 1914 he was active in the Second International, a world-wide Socialist organization. This broke up early in World War I, when Socialists in some countries supported their governments instead of denouncing the hostilities. Lenin demanded that in each country the war be changed into a civil war against the property-owning classes.

Return to Russia. The news of the downfall of Czar Nicholas II in March, 1917, found Lenin in exile in Switzerland. In his impatience to return home, he accepted for himself and his friends the offer by the Imperial German government of a sealed railroad car to go to Russia across Germany. The Germans were sure that Lenin would aid their cause by taking Russia out of the war. But Lenin's own aim was to make not only Russia but the whole world, Germany included, first socialist and then communist.

Arriving in Petrograd (as Saint Petersburg was then called) in April, 1917, Lenin urged his faction to overthrow the moderate provisional government which had succeeded the czar. Even some of Lenin's friends were shocked, and at first would not follow him. But soon, as the provisional government continued to hesitate on the problems of peace and land-redivision, the Russian masses joined Lenin's Bolsheviks.

In October, 1917, the Bolsheviks seized the Winter Palace in Petrograd where the provisional government held out. Lenin, until then in hiding, came out to take power for his party in the name of the *soviets*, or councils of workers and soldiers. In the new Soviet government, he became premier.

National Leader. Lenin ruled Russia as a virtual dictator, and tried to bring in socialism and communism. He took over for his new state all the factories, mines, public utilities, banks, and stores. He introduced terror as a means of enforcing his policies. As he had promised, Lenin took Russia out of World War I by accepting the Brest-Litovsk Treaty in March, 1918. But, instead of real peace, he gave Russia the horrors of a civil war which raged until 1921. His Red Army finally won, but the nation lay in ruins.

To rally the Russian people, Lenin canceled some of his early repressive measures. His New Economic Policy (NEP) of 1921 returned some industries and trades to private enterprise. In farming and manufacturing, in selling and buying, private enterprise revived Russia. But to his faithful Communists (as the Bolsheviks had been renamed), Lenin promised that these concessions to capitalism were only temporary.

In 1918, Lenin had been shot and wounded by a political opponent. These wounds, and the strain of overwork, weakened him. He had two strokes in 1922, and one more in 1923. On Jan. 21, 1924, he died. Struggle for power among his associates began at once, and in time Joseph Stalin won. Lenin's body was preserved by a special process and put in a tomb in Moscow's Red Square.

ALBERT PARRY

See also BOLSHEVIK; RUSSIA (The October Revolution); RUSSIAN REVOLUTION; TROTSKY, LEON.

LENINGRAD, *LEHN in grad* (pop. 2,888,000; met. area, 3,675,000; alt. 25 ft.), is the second largest city in Russia, and has the 12th largest population of any city in the world. It ranks second to Moscow among Russia's industrial cities, and has the country's best-equipped port. Leningrad is named for Lenin, who organized the communist government in Russia.

The city has had three different names. Peter the Great, who founded it in 1703 as his capital, named it *Saint Petersburg*. When Russia went to war against Germany in 1914, the name was changed to the Russian name *Petrograd*, which means *Peter's City*. The Russians did this to get rid of the German ending *burg*. The communist government gave the city its present name when Lenin died in 1924.

Location and Description

Leningrad lies along the Baltic Sea at the eastern end of the Gulf of Finland, about 400 miles northwest of Moscow. It is about as far north as Anchorage, Alaska, and is the northernmost city in the world with more than a million persons.

Most of the city is on the southern bank of the Neva River. The remainder covers several islands formed by the branches of the river's delta. Leningrad has achieved fame for its wide boulevards and for its palaces and public buildings. About 120 bridges connect the various parts of the city. Most of these bridges cross narrow canals.

The main part of the city is divided by three long avenues that meet at the Admiralty, the center of Leningrad. The principal thoroughfare, Nevsky Pros-

Sovfoto

A Chariot of Victory, drawn by six rearing horses, stands on top of the imposing Narva Gate in Leningrad.

pekt, is about 130 feet wide and about 4 miles long.

Famous Buildings. In the days of the czars, Leningrad was famous for luxurious palaces and handsome public buildings. The Soviets turned many of these into museums, or converted them to other uses. Most of the buildings suffered serious damage during World War II, but were later repaired.

Several important structures stand along Nevsky Prospekt. The Cathedral of Our Lady of Kazan, with its semicircular colonnade of Corinthian columns, now contains the Museum of Religion and Atheism of the Academy of Sciences. Other buildings along this street include the former Imperial Library (now the Public Library); the former Alexander Theater (now the Kirov Theater); and the former Anichkov Palace (now a children's recreation center).

The Smolny, a former girls' school, stands on the Neva. Lenin used it as his headquarters during the Bolshevik Revolution of 1917, and it now serves as the Leningrad Communist party headquarters. The Winter Palace also faces the Neva. Built in baroque style between 1754 and 1762, it is a huge, dark-red building 500 feet long and 385 feet wide. It was the official residence of the czars until 1917. When fully occupied, it accommodated 6,500 persons and was the largest royal palace in the world. It is now an extension of the Hermitage (see the *Museums* section of this article). Nearby are the former Admiralty, which now houses the Central Historic Archives, and St. Isaac's Cathedral, a present-day museum.

A number of notable buildings stand on Vasilevsky Island, across from the Admiralty. They include the former stock exchange (Bourse), which now includes the Central Naval Museum; and the former Customs House, which now houses the Pushkin Institute of Russian Literature. The University of Leningrad also is there. In addition, the island features the former seats of the Academy of Sciences and the Academy of Arts, both of which were moved to Moscow.

The Fortress of Peter and Paul, now a museum, is on a small island that also has a cathedral bearing the same name. A nearby attraction is the small wooden house in which Peter the Great lived when he began to build Leningrad.

Climate. Although Leningrad is located at about 60° north latitude, westerly winds from the Atlantic Ocean tend to moderate its climate. The temperature averages 17° F. in January, and 65° F. in July. Leningrad has an average of about 21 inches of precipitation annually, most of it during the summer. Moderate temperatures and negligible evaporation give the area an excess of moisture. This has resulted in marshy conditions in much of the city. Engineers have had to drive thousands of piles into the ground to support the foundations of buildings. Ground water often floods basements. Strong winds from the Atlantic Ocean sometimes drive the water of the funnel-shaped Gulf of Finland into the arms of the Neva River, causing serious floods in Leningrad. The worst floods occurred in 1824 and 1924, when water covered almost all the streets.

Education

Schools. The University of Leningrad stands at the head of the city's educational system, which includes about 8 per cent of the country's college and university students. The city also has many elementary and secondary schools for children, some secondary schools for adults, a number of schools specializing in technology, music, and art, and some schools for the rehabilitation of disabled war veterans. Leningrad has almost 200 scientific research institutions, with 15 per cent of Russia's research workers.

The Rimsky-Korsakov State Conservatory is Russia's oldest music school. The Leningrad State Choreographic School is the oldest dancing institute in the country. One of the world's greatest astronomical observatories operates at Pulkovo, a suburb 10 miles southwest of the city.

Libraries. Leningrad ranks second in Russia to Moscow in the number of libraries and museums its inhabitants can enjoy. The largest of the 1,800 libraries are the Saltykov-Shchedrin Public Library and the library of the Soviet Academy of Sciences. The Public Library has 12,000,000 volumes and manuscripts. The library of the Academy of Sciences owns 10,000,000 volumes, including a valuable collection of Russian books and periodicals published in the 1700's, and one of the world's largest collections on Slavic languages and literature. The libraries of the Academy of Arts and Leningrad University also have valuable collections of books and periodicals.

Museums. Leningrad has about 50 museums. Probably the best known is the Hermitage, famed throughout the world for its masterpieces. Italian paintings include Raphael's *Conestabile Madonna*, Titian's *Magdalene Repentant*, and works of Veronese and Giorgione. The Dutch and Flemish paintings include Rembrandt's *The Return of the Prodigal Son*, works by Van Eyck, and portraits by Frans Hals. Among the French paintings are Poussin landscapes, Lorrain's *Harbor Views*, and Delacroix' *The Lion Hunt*.

The Russian Museum has large collections of prerevolutionary and Soviet art. The Leningrad branch of Moscow's Central Lenin Museum features exhibits on the life and work of the founder of the Soviet state. A group of natural-science museums belonging to the Academy of Sciences deals with soil science, zoology, and geology. The Museum of Anthropology and Ethnology has exhibits on the peoples of Asia, the Middle East, and Africa. The State Museum of Ethnography of the Peoples of the U.S.S.R. is the largest of its kind in the country.

Work of the People

Industry. Most of the city's industrial employees work in metal-fabricating plants and machine-building factories. Leningrad is one of Russia's leading producers of turbines and other heavy electrical generating equipment. The city has large shipyards, locomotive and railroad shops, chemical plants, textile mills, and foundries. Leningrad's skilled labor force produces a large part of Russia's precision instruments. Almost all the raw materials that Leningrad uses for manufactured products must be imported from other parts of the country. These materials include coal, oil, steel, nonferrous metals, chemical raw materials, and fibers. Leningrad is one of Russia's leading printing and publishing centers. The city's 30 publishers issue about

150,000,000 books a year, and many periodicals.

Transportation. Leningrad is Russia's leading port. More than a hundred ships can anchor in the harbor at the same time. A ship canal built in 1885 connects the port with Kronstadt, a Russian naval base on the Gulf of Finland. The Baltic-White Canal links Leningrad with Belomorsk on the White Sea. Ice forms in the harbor during the three coldest months, but icebreakers can usually keep traffic moving. Several railroads and airlines connect Leningrad with other important Russian cities.

History

Peter the Great founded Leningrad as Saint Petersburg in 1703. Much of Leningrad's present-day beauty can be attributed to him. Not only did he make it the capital of Russia, but he also designed it. The city grew rapidly into the intellectual and social center of the Russian Empire. When World War I began in 1914, it was a thriving city of more than 2,000,000 persons. It ranked as the fifth largest city in Europe and as the eighth largest in the world.

When the communist government came to power in 1917, it moved the capital to Moscow. Leningrad, then called Petrograd, declined. By 1923, it had a population of only about 1,000,000. After 1924, the Russians began to redevelop the city. By the outbreak of World War II, it had regained much of its former importance.

The Red Army defended Leningrad against the Germans during a famous siege that began in October, 1941, and did not end until January, 1944. The end of the war found all parts of Leningrad damaged, and many of the suburbs practically wiped out. Most of the area has been rebuilt.

Theodore Shabad

LENNOX ISLAND. See Prince Edward Island (Interesting Places to Visit).

LENOIR, *luh NWAHR,* **JEAN JOSEPH ÉTIENNE** (1822-1900), a French citizen born in Luxembourg, was one of the first to build a practical internal-combustion engine. By 1860, he was producing a reliable engine equipped with an electric ignition system and using illuminating gas as a fuel. Many hundreds of these engines were constructed. They were used throughout Paris. About 1863, Lenoir built one of the first automobiles to use a gas engine. This engine was a one-cylinder unit of his own design.

Smith Hempstone Oliver

See also Automobile (The Gasoline Car); Gasoline Engine (Development).

LENOIR-RHYNE COLLEGE is a coeducational liberal arts school at Hickory, N.C. It was founded in 1891 by the Lutheran Synod in North Carolina. Courses offered lead to the B.A. and B.S. degrees. For enrollment, see Universities and Colleges (table).

LENORMAND, SEBASTIEN. See Parachute.

LE NÔTRE, *luh NO tr',* **ANDRÉ** (1630-1700), a French landscape designer, created most of the famous gardens of his day. These included Kensington Gardens and St. James's Park in London; Versailles, Saint-Cloud, Fontainebleau, Vaux, and Chantilly gardens in France; and the Quirinal and the Vatican gardens in Rome. He used sculpture to create effects of grandeur. Le Nôtre considered his garden at Chantilly as his finest work. He was born in Paris.

Robert E. Everly

See also Versailles.

LENROOT, KATHARINE F. See Children's Bureau.

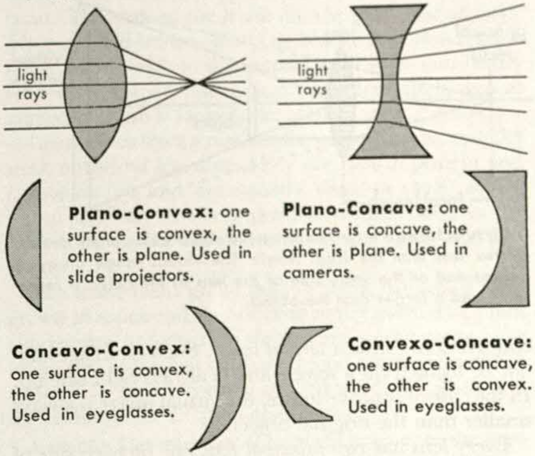
LENS, *lehnz,* is a transparent object that has at least one curved surface. Lenses are used to form magnified or reduced images, or to concentrate or spread light rays. Most lenses are made of glass, but any transparent material may be used. Sometimes Lucite or some other plastic, less breakable than glass is used. Some lenses are made of transparent crystals, such as quartz. Quartz transmits ultraviolet rays better than many other materials (see Ultraviolet Rays).

Uses of Lenses. Lenses have many important uses. The glasses used by people to aid their eyesight consist of lenses. Some persons use contact lenses that fit on the eye (see Lens, Contact). Optical instruments such as microscopes and telescopes have lenses. So do binoculars, cameras, field glasses, and motion-picture projectors.

Kinds of Lenses. There are six basic types of simple lenses. These are shown in the drawing with this article.

TYPES OF LENSES

Six Lens Types. The converging, or convex lenses, *left,* bring light rays into sharp focus. The diverging, or concave lenses, *right,* spread light rays apart.



Double-Convex: both surfaces are convex. Used in magnifying glasses.

Double-Concave: both surfaces are concave. Used in reducing glasses.

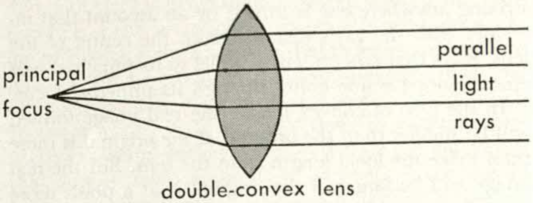
Plano-Convex: one surface is convex, the other is plane. Used in slide projectors.

Plano-Concave: one surface is concave, the other is plane. Used in cameras.

Concavo-Convex: one surface is convex, the other is concave. Used in eyeglasses.

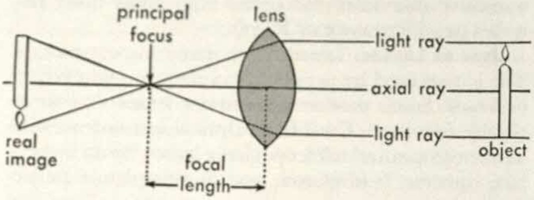
Convexo-Concave: one surface is concave, the other is convex. Used in eyeglasses.

Lenses that are thicker at the center than at their edges are called *convex, converging,* or *positive.* Lenses that are thicker at their edges are called *concave, diverging,* or *negative.*



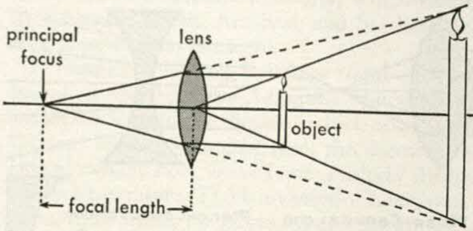
Parallel Light Rays are brought to a focus when they pass through a double-convex lens.

A convex lens can bring parallel light rays from a small distant source to a sharp *real focus*. You can see this focus by holding an ordinary magnifying glass in the sun and moving the glass so that it focuses a tiny bright dot of light on a piece of paper. The paper will usually burst into flame from the heat of the focused rays. These lenses can form a *real image*—so called because the light rays pass through the lens to form the image. A real image can be focused on a screen and is always inverted, or upside down.



A Real Image is formed when light rays from an object pass through a double-convex lens. The real image always is inverted. It is smaller than the object if the object is farther from the lens than twice the focal length.

A concave lens spreads parallel light rays apart to form a sharp *virtual focus*. A virtual focus appears to be on the same side of the lens as the source of light. A concave lens forms a *virtual image*. Such an image cannot be focused on a screen and is always right side up. In the case of concave lenses, the virtual image is always smaller than the original object.



A Virtual Image is formed when the object is nearer the double-convex lens than the focal length. The virtual image always is upright and on the same side of the lens as the object it represents, and is larger than the object.

Every lens has two *principal foci*, one on each side of the lens, because light rays can either enter or emerge from the lens parallel to the principal axis. This axis is a line perpendicular to the center of the lens. The distance of these foci from a simple thin lens is called the *focal length* of the lens. A light ray passing through the center of a thin lens keeps its original direction. A ray striking anywhere else is turned by an amount that increases with the ray's distance from the center of the lens. Rays that enter a lens parallel to its principal axis emerge along a line going through its principal focus.

In the case of convex lenses, the real image formed will be smaller than the original, if the original is more than twice the focal length from the lens. But the real image will be larger, if the original is at a point more than, but not twice, the focal length away. If the original is less than a focal length away, a virtual image larger than the original image is formed.

Simple lenses cannot form sharp, undistorted colorfree images over a wide field. Such defects are corrected by using combinations of lenses. Some lenses, called *achromatic*, correct for color aberrations (see ABERRATION). Other lenses, called *anastigmatic lenses*, correct a tendency of single lenses to distort straight lines (see ASTIGMATISM).

JOSEPH VALASEK

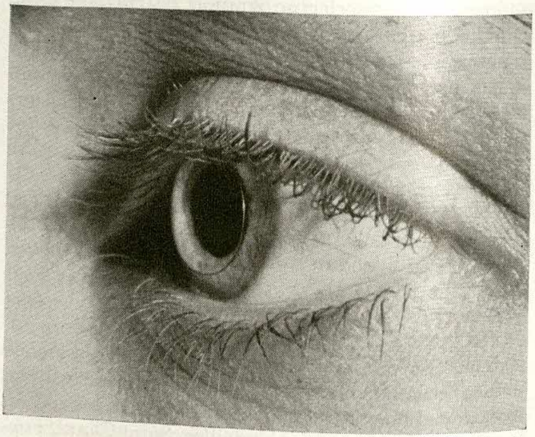
Related Articles in WORLD BOOK include:

Camera
Eye
Field Glass
Glasses
Lens, Contact
Magnifying Glass
Microscope
Telescope
Television (How the Television Camera Works)
Zeiss, Carl

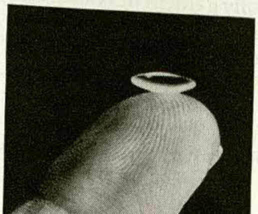
LENS, CONTACT. A contact lens is a plastic eyeglass that is worn directly on the eyeball. Contact lenses are often worn by airmen for eye protection. The first lenses of this type were developed in Germany. They were made of glass. But later a method was found to make them from plastic, a material lighter and less fragile than glass.

Contact lenses have three advantages over ordinary glasses. They usually cannot be seen. The eyelid keeps them from frosting in bad weather. Also, many persons have faulty vision because their corneas are not correctly shaped. In this condition, ordinary lenses cannot give much correction. But contact lenses are fitted to the eyeball and correct the defect in vision despite the eyeball's shape.

When someone is given contact lenses that cover the entire eye, his eyes are first anesthetized and an impression is taken of the eyeball. A cast is made from the impression and the lens is made from the cast. Then the patient tries various chemical solutions to find one that will fill the space between the lens and the cornea without irritating his eye. The solution must also keep the eye clear. A solution of distilled water, sodium bicarbonate, and sodium chloride is used. These chemicals are mixed in different proportions until the patient finds the best one. The fluid is changed about every four hours to keep the cornea from clouding. A person can



Plastic Contact Lenses Co.



Contact Lenses float on the eye's natural tear layer, *above*. Balanced on the tip of a finger, *left*, the lenses can be placed on the eye. They cover less than 60 per cent of the cornea, the colored part of the eye.

easily remove and replace the lens with his fingers. One type of contact lens fits over only the cornea and does not require the use of a chemical solution.

Contact lenses protect the eyes from dust, rain, wind, and other discomforts. Actors and actresses use them. Football players and other athletes who need glasses but cannot run the risk of wearing ordinary glasses often use contact lenses. The lenses can be colored without interfering with vision. A brown-eyed person, for example, can appear blue-eyed. Motion-picture actors often use this advantage of the contact lens. Contact lenses cost more than eyeglasses. John R. McWilliams

See also Glasses; Lens.

LENSKI, LOIS (1893-   ), an American writer and illustrator of children's books, received the Newbery medal in 1946 for *Strawberry Girl*. She has written and illustrated many picture books, historical stories, and modern regional stories of American life. Her works include *The Little Auto* (1934), *Phebe Fairchild* (1936), *Ocean-Born Mary* (1939), *Blueberry Corners* (1940), *Indian Captive* (1941), *Bayou Suzette* (1943), *Judy's Journey* (1947), and *Prairie School* (1951).

Lois Lenski was born in Springfield, Ohio. She attended Ohio State University and the Westminster School of Art in London. George E. Butler

LENT is a religious season observed in the spring by Christian churches. It begins on Ash Wednesday, 40 days before Easter, excluding Sundays, and ends on Easter Sunday. The term *Lent* comes from the Old English word *lencten*, which meant springtime. The word used in church liturgy is *Quadragesima*. Lent is part of the regular church year in the Roman Catholic, Anglican, Eastern Orthodox, and Protestant Episcopal churches. Other Protestant churches hold religious services, meetings, or preaching missions to honor the Lenten season. Some churches prescribe a special book of devotions for Lent. In the Roman Catholic Church, each day of Lent has its special mass. Clergymen wear purple vestments at the services.

Many Christians observe Lent by fasting, performing penance, giving alms, abstaining from amusements, or not solemnizing marriages. The season originated as one of spiritual preparation for Easter in remembrance of the passion, death, and resurrection of Jesus Christ. It also symbolized the mourning of the Church, the bride, for the departure of Christ, the bridegroom. The length of time for observing Lent varied through the ages. For many years, it was considered a 36-day period of fast. By the reign of Charlemagne, about A.D. 800, four days were added, making it 40. This may have been done as a reminder of the 40 days that Jesus Christ fasted in the wilderness. Bernard Ramm

See also Ash Wednesday; Easter; Palm Sunday.

LENTICEL, *LEHN tih sell*, is a round or long swelling on the bark of woody stems that functions as a breathing pore. Lenticels are formed when growth areas develop beneath the cortex, or outer layers of the bark. Each growth area produces a mass of new growing cells. As these cells enlarge, they press against and finally break the outer layer of the stem to form a lenticel. The cells of the lenticel are separated by spaces through which air reaches the inner parts of the stem. The rounded marks on horse chestnut stems and the long marks on cherry bark are lenticels. Clarence J. Hylander

See also Bark.

The New York Botanical Garden

The Lentil, an ancient plant that grows in southern Europe, Egypt, and western Asia, is usually used to make soups.

LENTIL is an ancient food plant. It belongs to the leguminous family of plants, and grows in southern Europe, Egypt, and western Asia. The lentil has long fruits, or pods, which look like those of the pea and bean. The seeds of the lentil are the part used as food. They are red-brown, gray, or black, and never grow larger than $\frac{1}{2}$ inch in diameter. Lentil seeds can be described as shaped like a lens. The lens itself was so named because it looked like a lentil seed.

Lentil seeds have a distinct flavor, and are among the most nutritious legumes. They are rich in protein and carbohydrates and are usually used to make soups. Lentil seeds are not very popular as table food in the United States, because most Americans prefer peas and beans.

The lentil plant grows best in light, dry soil. Plants grown in a rich soil do not bear many pods. The plant can be used as fodder for sheep, horses, and cattle. The lentil, one of the first cultivated food plants, was grown about 2200 B.C. According to Genesis 25: 34, Esau sold his birthright for a "pottage of lentils."

Scientific Classification. The lentil belongs to the family *Leguminosae*. This plant is classified as genus *Lens*, species *culinaris*. S. H. Wittwer

See also Vegetable (Planting Table for Vegetables).

LENZ, HEINRICH OSKAR. See Exploration and Discovery (table, Famous Explorers).

LENZ'S LAW is a principle of physics important in the design of electric generators. It was developed by Heinrich F. E. Lenz, a German-born scientist who was working in Russia. Lenz's law says that in an electric generator, the current produced creates a magnetic field that opposes the action of the force that produces the current. In other words, work must be done to generate electricity. Powerful turbines are needed to run generators that supply large amounts of current. According to Lenz's law, the magnetic field can be used as a "brake" to slow down the generating mechanism. See also Electric Generator (Electromagnetism). Ira M. Freeman

LEO is the name of 13 popes of the Roman Catholic Church. Five of the popes were *canonized*, or made saints in the church. Leo XIII was an especially important pope. Their reigns were:

Leo I, Saint	(440-461)
Leo II, Saint	(682-683)
Leo III, Saint	(795-816)
Leo IV, Saint	(847-855)
Leo V	(903)
Leo VI	(928)
Leo VII	(936-939)
Leo VIII	(963-965)
Leo IX, Saint	(1049-1054)
Leo X	(1513-1521)
Leo XI	(1605)
Leo XII	(1823-1829)
Leo XIII	(1878-1903)

Saint Leo I, one of two popes commonly given the title "The Great," brought the practical qualities of energy, perseverance, and human understanding to the papal office. Conscious of his rights as pope, he successfully enforced his authority in both the West and the East. In the western provinces, Leo regulated discipline and attacked heresy. He persuaded Attila the Hun to spare Italy in 452. Three years later, Leo persuaded the Vandal leader, Genseric, not to subject Rome to fire and indiscriminate slaughter (see Attila; Genseric).

Leo's greatest triumph was over the Eastern bishops. When he sent a formal statement of the church's teaching to settle authoritatively an Eastern theological dispute, the Eastern bishops accepted it with the famous statement: "Peter has spoken through Leo."

Saint Leo III crowned Charlemagne Emperor of the West in 800. This appointment cemented a close relationship between the church and the state. Charlemagne guaranteed the pope's temporal authority in the Papal States, and the pope gave his blessing to Charlemagne's imperial rule (see Charlemagne).

Leo X helped Rome become the center of the artistic and literary world. He was an ardent scholar and patron of the arts. Through his efforts, scholars obtained high positions in the papal court.

Leo encouraged the preaching of indulgences in Germany to raise money for the rebuilding of Saint Peter's Church. The preaching of indulgences helped cause Martin Luther's break from the Roman Catholic Church and the beginning of the Reformation. Up to the time of his death in 1521, Leo never took the movement started by Luther seriously (see Luther, Martin).

Leo was born in Florence, Italy, the son of Lorenzo the Magnificent of the Medici family (see Medici).

Leo XIII enjoyed one of the longest reigns in papal history. He is best known for his *encyclicals*, or papal letters to bishops, on social and religious subjects. His most famous encyclical, *Rerum Novarum*, is often called "the Magna Carta of labor" because it upheld the rights of the working classes.

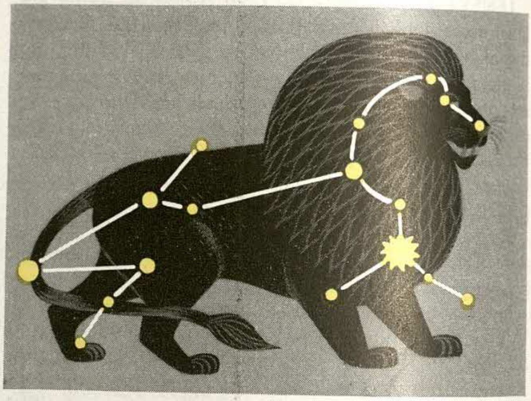
Leo, a brilliant diplomat, helped make the Roman Catholic Church acceptable to the non-Catholic world. His diplomatic successes included mediating a dispute between Spain and Germany over the Caroline Islands and directing French Catholics to support loyally their republican government.

Born Gioacchino Vincenzo Raffaello Luigi Pecci, in Carpineto, he studied at the Jesuit College in Viterbo, and in Rome. He was ordained a priest in 1837. He served for over 20 years as archbishop of Perugia. He became a cardinal in 1853, and succeeded Pope Pius IX when he was 68.

Thomas P. Neill and Fulton J. Sheen

LEO, or **LION,** is the fifth sign of the zodiac, as well as a constellation. The constellation appears in the sign Virgo. Leo is one of the oldest constellations, and was described as a lion in the oldest known zodiac. The brightest star in Leo is Alpha Leonis, or Regulus. Regulus is sometimes called *Cor Leonis*, because it marks the heart of the lion. The head of Leo is outlined by a group of stars shaped like a sickle, with Regulus in the handle. The tuft of the lion's tail is marked by the star Denebola, whose name comes from an Arabic phrase meaning "tail of the lion."

I. M. Levitt



Leo the Lion Is the Fifth Sign of the Zodiac.

See also Leonids; Regulus; Zodiac.

LEÓN, *lay OHN* (pop. 122,663), officially León de los Aldamas, is an industrial and commercial center in south-central Mexico. The city stands about 200 miles northwest of Mexico City. For location, see Mexico (color map). Mines near León produce gold, silver, copper, lead, and tin. Factories manufacture leather goods, shoes, clothing, pottery, and other products. Craftsmen in León make fine jewelry and other articles of gold and silver. The Spanish conquerors of Mexico founded the city in 1576.

John A. Crow

LEÓN, *lay OHN* (pop. 30,544), is the chief intellectual center of Nicaragua, and one of the country's most important markets for farm products. The city lies in a rich farming district in western Nicaragua, about 50 miles northwest of Managua. For location, see Nicaragua (color map).

León is the home of the National University of Nicaragua, as well as a national institute and two religious colleges. The city's many fine buildings include the largest cathedral in Central America.

Spanish explorers founded León in 1525 on the shores of Lake Managua. It was moved to its present location in 1610 after the old town was destroyed by an earthquake. León served as the provincial capital of Nicaragua for many years, and then as the capital of the republic until 1855.

Rollin S. Atwood

LEÓN, PONCE DE. See Ponce de León, Juan.

LEONARD, BENNY. See Boxing (table; picture).

LEONARDO DA VINCI. See Da Vinci, Leonardo.

LEONCAVALLO, *lay OHN kah VAHL loh,* **RUGGIERO** (1858-1919), was an Italian composer of operas. His greatest triumph was *I Pagliacci* (1892), for which he wrote both words and music. Inspired by Richard Wagner, he created a trilogy, *Crepusculum* (1898), which failed. *Zaza* (1900) was a success. Leoncavallo's other works include the operetta *Are You There?* (1913), the opera *The Youth of Figaro* (1906), and a symphonic poem, *Serafita* (1908). He was born in Naples and studied music for several years at the Naples Conservatory. See also Opera (Some of the Famous Operas [I Pagliacci]). Joyce Michell

LEONIDAS I, *lee AHN uh dus* (? -480 B.C.), ruled the Greek state of Sparta. In 480 B.C., he and most of his men died defending the pass at Thermopylae from the invading Persians. Outnumbered 50 to 1, they held their ground for two days. Their heroism aroused all Greece to fight the invaders. See also Thermopylae.

LEONIDS are meteors that seem to come from the constellation Leo. They were once seen every year around November 14. The orbit of the Leonids around the sun has been changed by the planetary attraction of Jupiter and Saturn. For this reason, the earth no longer passes through this swarm of meteors, and the Leonids cannot be seen. Heavy showers of Leonids were seen in 1799, 1833, and 1866. See also Leo, or Lion; Meteor. Joseph Ashbrook

LEOPARD, *LEHP urd,* is a large member of the cat family. It is the third largest cat of the Eastern Hemisphere. Only the lion and tiger are larger. Leopards live in Africa as far north as the Sahara, and in Asia from Israel to China, Malaya, and Sumatra.

Leopards are graceful, alert, and cunning. They average 2 feet 4 inches high at the shoulder and 7 feet 6 inches long, but a big male may measure almost 9 feet from nose to tail. A large male weighs from 100 to 160 pounds, and a big female about 75 pounds. Leopards bear two, three, or four young in a litter.

The usual coat of leopards is light tan, with many black spots close together. The tail has dark rings around it. All leopards are much alike, but those that live in forests are darker than those that live on open plains and desert scrub. The black leopard is so dark that the spots are hard to see. The whole animal looks black. Albinos are much rarer than the black variety, which is common in Malaya and in southwestern China.

These fierce animals eat meat and hunt their prey. They feed on such animals as monkeys, antelopes, muntjacs, jackals, peacocks, snakes, sheep, goats, and dogs. In Africa, they even kill the big porcupines that have quills a foot or more in length. Like other great cats, they especially prey on dogs. Leopards seldom attack human beings. But once they discover that people are easy victims, they may become more dangerous than tigers or lions. Leopards are good climbers and spend part of their time in trees. They are unbelievably strong. Carcasses of prey weighing 80 to 150 pounds have been found in trees 12 to 20 feet above the ground where a thrifty leopard had carried them.

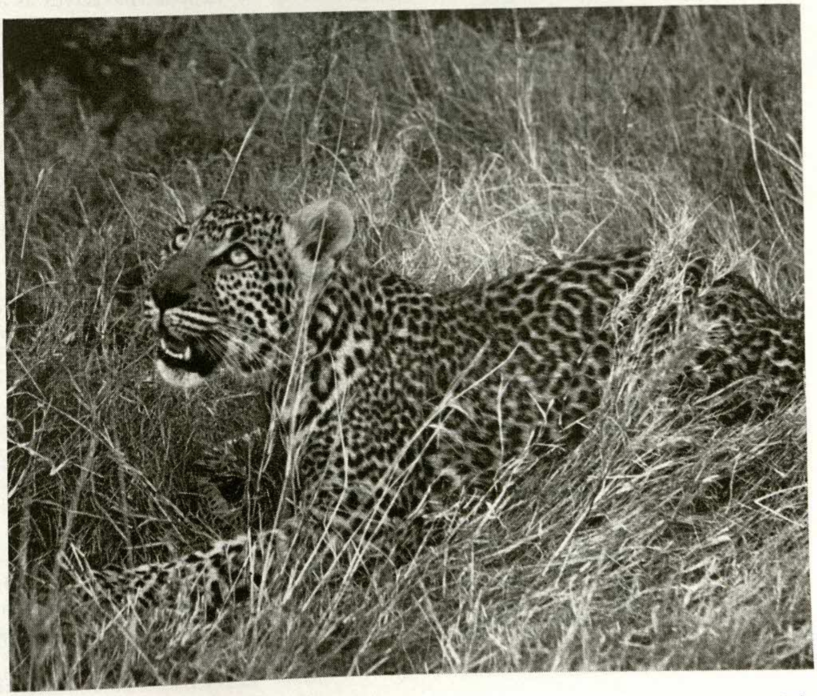
The handsome markings of the leopard make its fur valuable for coats. A familiar expression says that the leopard cannot change its spots. This means that some things about a person remain unchanged all his life. The saying comes from the Bible (Jeremiah, 13: 23).

Scientific Classification. The leopard belongs to the family *Felidae*. It is classified as genus *Felis*, species *pardus*. Victor H. Cahalane

See also Animal (color picture, India, South Asia, and East Indies); Cat; Fur (Names of Furs).

LEOPARD CAT. See Ocelot.

Ylla, Rapho-Guillumette



The Savage Leopard is as fierce as the lion and tiger. Leopards sometimes turn into notorious man-eaters, cleverly escaping capture for many years. Some leopards raised in captivity become quite gentle.

Belgian Government Information Center

Albert Boulevard in Léopoldville Is One of the Many Wide, Tree-Lined Avenues That Span the Attractive City.

LEOPARDI, *lay oh PAHR dih,* **GIACOMO** (1798-1837), was an Italian poet. The concise style of the ancient Greek and Roman classics influenced him deeply, although he lived during the Romantic period. Leopardi was born a sickly and crippled child of a conservative, aristocratic family. He eventually lost all faith in religion and in the political aspirations of Italy. But in spite of this, the language of his prose *Thoughts* (1827), and of his verse, *Songs* (1824), is clear and strong. Leopardi was born in Recanati, Italy. WERNER P. FRIEDERICH

LEOPOLD is the name of three kings of Belgium.

Leopold I (1790-1865), son of Francis, Duke of Saxe-Coburg, was elected by the Belgians as their king in 1831. He was the uncle of Queen Victoria of Great Britain, and became noted as a wise statesman. He was born at Coburg, Germany.

Leopold II (1835-1909) was the son of Leopold I. He became particularly interested in the exploration and colonization of Africa. He founded the Congo Free State, which he gave to Belgium in 1908. He was born in Brussels. See BELGIAN CONGO (History).

Leopold III (1901-), the grandnephew of Leopold II, became king in 1934 after the death of his father, King Albert. He was very popular at first. But he lost much of this popularity in 1940 when he surrendered his army to the Germans after a gallant resistance. Instead of escaping to England, he remained a prisoner in Belgium.

When the war ended, many Belgians refused to have him as their ruler. After some trouble, Leopold agreed to withdraw in favor of his son. He formally abdicated in 1951, and his eldest son, Baudouin, became king. Leopold was born in Brussels. JANE K. MILLER

See also BAUDOUIN.

LÉOPOLDVILLE, *LAY OH POHLD VEEL* (pop. 306,117; alt. 1,045 ft.), is the capital and largest city of Congo. It lies on the south bank of the Congo River, 350 miles from the Atlantic Ocean. Brazzaville, the capital of the Republic of the Congo, stands directly across the river. For location, see CONGO (map).

Léopoldville serves as an important shipping center for the Congo region. The Livingstone Falls just south of the city make it impossible to sail all the way down the Congo. Cargoes are carried by ships down the river to Léopoldville, then transferred to trains which take them to Matadi on the lower river.

The city is one of the most attractive in tropical Africa. It also has a modern airport, a radio station, a zoo, and a museum of native arts and crafts. Lovanium University, founded in the 1950's, is nearby.

Explorer Henry M. Stanley founded Léopoldville in the 1880's. HARRY R. RUDIN

LEPANTO, BATTLE OF. See CERVANTES SAAVEDRA, MIGUEL DE; NAVY (Famous Sea Battles of History); TURKEY (The Ottoman Empire).

LEPIDOPTERA, *LEHP ih DAHP tuh ruh,* is a large order of insects that includes the butterflies and moths. The name comes from Greek words for *scale* and *wing*. The wings of these insects are covered with tiny scales or flat hairs. The mouth parts form a long tube called a *proboscis*, which is used for sucking.

Scientific Classification. The order *Lepidoptera* is in the phylum *Arthropoda* and the class *Insecta*. WILLIAM C. BEAVER

See also BUTTERFLY; INSECT; LEAF MINER; METAMORPHOSIS; MOTH (with its list of Related Articles).

LEPIDUS, MARCUS AEMILIUS. See ANTONY, MARK; AUGUSTUS; TRIUMVIRATE.

LEPRECHAUN. See FAIRY (Leprechauns).

LEPROSY, or **HANSEN'S DISEASE,** is a disease that affects the skin, the *peripheral* (end) nerves, and muscles in the arms and legs. It also may attack the lining of the nose, throat, and larynx. Injury to the nerves causes loss of the sense of feeling, and weakening and wasting of muscles. Leprosy may cripple a person severely, but it seldom causes death. It may shorten life by weakening a person and leading to tuberculosis or other diseases.

Cause. Leprosy is caused by a rod-shaped germ about $\frac{1}{4,000}$ of an inch long. The scientific name of the germ is *Mycobacterium leprae*. A Norwegian physician, G. Armauer Hansen, discovered the germ in 1874. It is often called *Hansen's bacillus*. Although the bacillus may be present in the skin in enormous numbers, scientists have been unable to grow it outside the body. Success in cultivation would permit rapid testing of drugs as possible destroyers of the germ. It also might lead to a vaccine to prevent the disease.

Leprosy is contagious, but it is much less contagious than tuberculosis. A person has little chance of contracting leprosy unless he lives in the same house or comes in close contact with an infected individual. Signs of the disease do not appear until months or sometimes years after contact.

Scientists do not know definitely how leprosy is spread. The germs probably escape from an infected person in discharges from ulcers in the nose or in the skin. The germ probably enters the bodies of healthy persons through breaks or cuts in the skin. These cuts may be so small that they are not noticed.

Effects of Leprosy. Deformities that occur in advanced cases keep people from realizing that leprosy is often a mild disease. An arrest (stoppage) or perhaps a cure of leprosy may occur even without treatment. Small patches on the skin that are undoubtedly leprotic sometimes disappear or leave only faint traces.

A leprosy patient can never hope for recovery after the nerves are seriously damaged. The bacilli enter the nerves and set up a destructive inflammation called *neuritis*. The nerves in the arms and legs are the most seriously affected. The patient loses the capacity to feel pain and to detect differences in temperature. He cannot feel the prick of a pin or the sting of a burn.

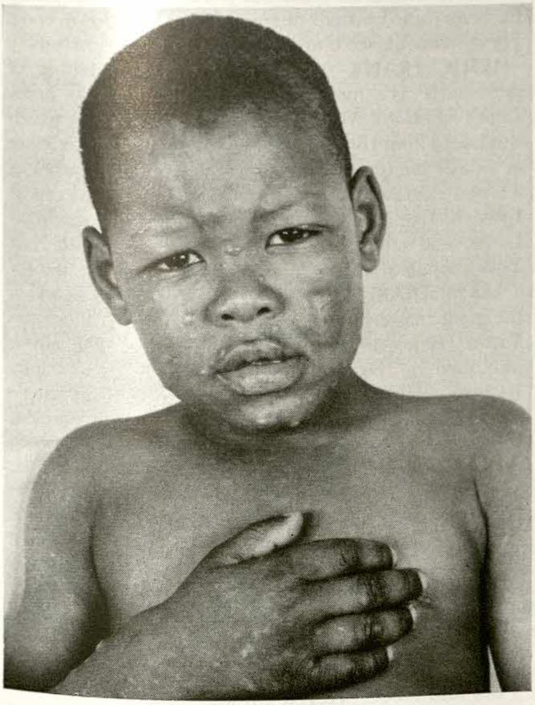
Each attack of neuritis weakens the muscles of the hands and feet. These attacks are often terribly painful. The fingers and toes may be drawn up (contracted). Small bones in the hands and feet lose their calcium and may waste away. Damage to the facial nerve often makes it impossible to close the eyelids tightly. As a result, the eyes may be injured.

Types of Leprosy. There are two major types of leprosy: (1) tuberculoid and (2) lepromatous.

Tuberculoid Leprosy causes *macules*, or patchy spots, on various parts of the body. Inflammation of the nerves occurs earlier in tuberculoid leprosy, and its effects are usually more severe than in the lepromatous type. The tuberculoid type is about as frequent in males as in females. Mild cases are common among children in countries with much leprosy. Patients seldom spread this type of leprosy to other persons.

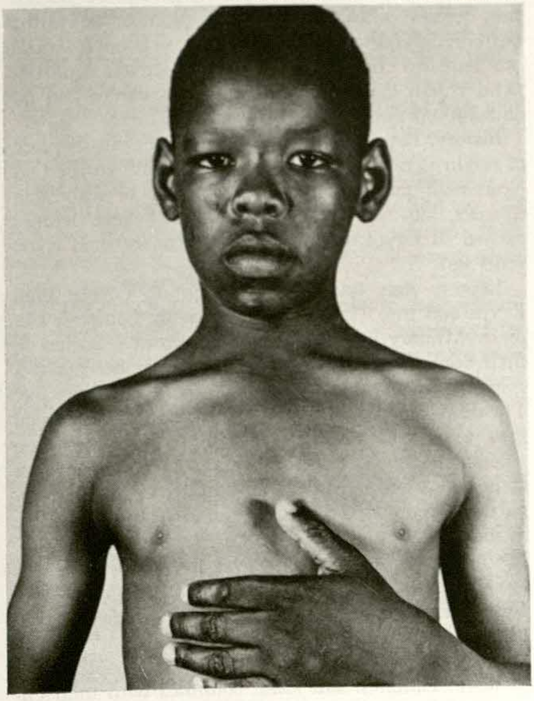
Lepromatous Leprosy causes a general thickening of the skin over most of the body, but particularly on the

Before Treatment. Nodules, or lumps, may appear on the face and hands of a leprosy patient before treatment with sulfone drugs is started. The skin thickens, and the eyes may be inflamed.



After Treatment. Prolonged sulfone treatment causes the lumps to disappear. Leprosy can be arrested in this way, but the disease cannot be cured. Treatment must be continued indefinitely.

Doull in *Medical Clinics of North America*



face and ear lobes. The lines of the face become deepened, and the eyebrows fall out. *Nodules*, or lumps, may appear in the skin. When the germs enter the eye, they cause a painful inflammation called *iritis*. This inflammation may cause blindness. In late stages, the damage to nerves equals that of the tuberculoid type. Lepromatous leprosy is more common in males than in females. It is contagious, and is chiefly responsible for the spread of leprosy.

Treatment. For hundreds of years, chaulmoogra oil was the popular remedy for treating leprosy. Drugs of the sulfone class have replaced chaulmoogra oil. Sulfone drugs were first used to treat leprosy in 1941 at the Public Health Service Hospital (National Leprosarium) at Carville, La. The common sulfones are *promin*, *diasone*, *sulphetrone*, and the so-called parent drug, *diamino-diphenyl sulfone (DDS)*. Unfortunately, the sulfones do not cure leprosy. After prolonged treatment with sulfones, the disease becomes inactive. But to prevent relapse, sulfone treatment must be continued indefinitely.

Streptomycin is the only antibiotic of proven value in treating leprosy. It is used for patients who fail to make satisfactory progress with sulfone treatment. Local application of a *cortisone* solution will relieve, but will not cure, lepromatous inflammation of the eyes. See CORTISONE; STREPTOMYCIN.

Bone surgery and transplantation of tendons from healthy to paralyzed muscles have partially restored the use of disabled hands and feet. Massage and special exercises also are helpful.

Control. The best possible leprosy control measure, if it were practicable, would be an active case-finding program. The program would be followed by hospitalization of all patients who discharge leprosy bacilli. But, because of the cost, hospitalization can be carried out only in countries where the disease is not a serious problem. To control leprosy, health services must depend chiefly on outpatient treatment clinics and on education of patients and their families.

History. Leprosy is an ancient disease, but its place of origin is unknown. The name "leprosy" in the Old Testament probably refers to a group of scaly skin diseases, not to leprosy. Historians believe leprosy existed in Egypt, China, and India more than 2,500 years ago.

Leprosy may have been brought to Greece from Egypt and into Italy from the East by Pompey's soldiers. Military movements, the return of crusaders to their homes, and an increase in ocean trade caused a spread of leprosy through Europe from A.D. 400 to 1400. The disease spread so rapidly that France passed special laws and built hospitals to protect the population against lepers. At one time in the 1500's there were as many as 600 lepers in one hospital in Paris. Fortunately, this dreaded disease began to decline in Europe in the 1500's.

Some historians believe slaves from Africa brought leprosy to North and South America. Emigrants from China were responsible for the spread of leprosy throughout the Pacific area in the early 1800's.

Leprosy occurs for the most part among peoples living in warm climates. But some countries with mild climates, such as Japan and South Korea, have many cases. Even Iceland has some leprosy patients.

The total number of cases in the world in the late 1950's was estimated at between 3,000,000 and 5,000,000. Six countries, with less than half the world's population, accounted for 85 per cent of the total. They were China, India, Nigeria, Congo, Indonesia, and Japan. The United States had a total of less than 1,500 leprosy cases.

JAMES A. DOULL

See also DAMIEN DE VEUSTER, JOSEPH; SCHWEITZER, ALBERT.

LERMONTOV, MIKHAIL. See RUSSIAN LITERATURE (Social Criticism).

LERNAEAN HYDRA. See HYDRA.

LESAGE, *luh SAHZH,* **ALAIN RENÉ** (1669-1747), was a French novelist and dramatist. He first practiced law, but left this career to become a writer. He was among the first to earn his living by writing. His most famous work, the novel, *Gil Blas de Santillane* (1715), is a witty satire on life in Paris. The story is told in the first person by Gil Blas, who learns to his sorrow that life can be harsh when one has to make one's own way without help. His innocence and vanity make him an easy victim. Lesage was born in Sarzeau, France.

F. J. CROWLEY

LESBIA. See CATULLUS, GAIUS VALERIUS.

LESBOS. See AEGEAN SEA.

LES CAYES, *lay KAY* (pop. 11,608; alt. 10 ft.), is a city on the south coast of the southern peninsula of Haiti, about 100 miles west of Port-au-Prince. For location, see HAITI (map). It is the leading port of southern Haiti, and was founded in the 1700's.

LESLEY COLLEGE is a private teachers college at Cambridge, Mass. Only women may do undergraduate work at Lesley, but men are admitted to the graduate school. Lesley has two laboratory schools, the Lesley-Ellis School for standard schooling, and the Lesley-Dearborn School for remedial work. The college grants bachelor's and master's degrees. It was founded in 1909. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LESLIE, FRANK (1821-1880), was a publisher of periodicals. His most popular publication was *Frank Leslie's Illustrated Newspaper*, later *Leslie's Weekly*, which was issued from 1855 to 1922. His paper was a forerunner of today's picture magazines. It grew out of his work as a wood engraver. Leslie was born HENRY CARTER at Ipswich, England. But he signed his engravings Frank Leslie, and adopted that name. Leslie came to New York City in 1848.

JOHN E. DREWRY

LES MISÉRABLES, *lay mi zay RAB luh*, ranks as one of the great masterpieces of world literature. It illustrates Victor Hugo's ideas about social justice. The novel, published in 1862, tells how poverty leads to crime. Its hero, Jean Valjean, steals bread to feed his sister's starving family. After 19 years in prison, he is paroled, but experiences the despair of a law-breaker when everyone rejects him. Even the jailers refuse him shelter. Valjean finally finds welcome with the bishop of Digne. He changes his name and becomes successful. But he cannot escape from a detective who tracks him down. Sent to prison again, Valjean escapes. He takes into his house an orphan, Cosette, who grows up believing him to be her father. Later, he reveals his true identity to her. Valjean dies happy, feeling that he has been true to the bishop's faith in him long ago.

F. J. CROWLEY

See also HUGO, VICTOR MARIE.

LESPEDEZA, *LESS pee DEE zuh,* is the name of a large group of shrubs in the pea family. They grow in North America, Asia, and Australia. Lespedeza shrubs are called *bush clover.* The leaves have smooth edges, and are made up of three leaflets. Lespedeza bears small pea-shaped flowers that grow in large clusters. The fruit is a short pod with only one seed. One lespedeza called *Japan clover* is grown chiefly in southern United States for forage, and as a green manure, or fertilizer.

Scientific Classification. Lespedeza belongs to the family *Leguminosae.* Japan clover is genus *Lespedeza,* species *striata.* J. J. Levison

LESSEE. See Lease.

LESSEPS, FERDINAND MARIE DE. See De Lesseps, Ferdinand Marie.

LESSING, GOTTHOLD EPHRAIM (1729-1781), was a German playwright, critic, and philosopher. His writing helped free German taste and thought from French influences. His first important play, *Miss Sara Sampson* (1755), was also the first "tragedy of common life" in German literature. It opened a new era in German drama. In *Emilia Galotti* (1772), Lessing wrote a tragedy and made its heroine a girl of the middle class. One of his best-known plays, *Nathan the Wise* (1779), expresses his ideal of religious tolerance. He also wrote a delightful comedy, *Minna von Barnhelm* (1767), dealing with the love of a rich girl and a poor Prussian officer. Lessing explained his theory of poetry and painting in *Laokoön,* published in 1766.

He was born in Kamenz, Saxony, the son of a Protestant minister. He studied theology and medicine at the University of Leipzig, but left to become a literary critic and dramatist. Lessing settled in Berlin in 1749. In 1760, he became secretary to the governor of Silesia, but he returned to Berlin five years later. In 1770, Lessing became librarian to the Duke of Brunswick at Wolfenbüttel. He held this position for the rest of his life. John W. Gassner

See also German Literature (The Rise of Nationalism)

LE SUEUR, *luh SOOR,* **PIERRE** (1657?-1705?), a French explorer and trader, helped open up the upper Mississippi River Valley. He came to Canada about 1679 and became an Indian trader. He persuaded the Sioux and Chippewa tribes to keep peace, and in 1695 took chiefs from these tribes to Montreal on a peace mission. During this period, he built Fort Le Sueur in what is now Minnesota. Later, he explored the Mississippi, and built Fort l'Huillier in 1700. Le Sueur was born in Artois, France. Thomas D. Clark

LETHAL, *LEE thul,* **CHAMBER,** or death chamber, is the legal means of execution in Arizona, California, Colorado, Missouri, Nevada, North Carolina, Oregon, and Wyoming. The condemned person is strapped in a chair in the airtight gas chamber. Glass globes, or "eggs," containing cyanide drop from beneath the chair and break in a crock containing sulfuric acid. The two chemicals mix and form deadly hydrocyanic acid gas. The condemned person loses consciousness immediately or within a few seconds. Death usually occurs within five minutes. The lethal chamber is regarded as one of the most humane forms of capital punishment, because it produces little suffering. John J. Floherty

See also Capital Punishment.

LETHBRIDGE, Alberta (pop. 29,462), is an industrial and distributing center for grain, livestock, coal, lumber, and natural gas produced in the southern part of the province. The city lies on the Oldman River, about 145 miles southeast of Calgary. For location, see Alberta (color map).

Lethbridge has vegetable and sugar-beet processing plants, farm-implement plants, flour mills, stockyards, a large brewery, and ironworks. Southern Alberta's great irrigation project lies nearby.

Lethbridge is the site of the largest earth-filled dam, the St. Mary's Dam, which is one mile across. The railroad bridge here is the longest and highest bridge in North America that runs on the top of a dam.

The city began as a coal-mining village in 1870, and was once known as Coalbanks. It was incorporated as a town in 1891, and became a city in 1906. Lethbridge has a council-manager government. W. D. McDougall

LETHE, *LEE thee,* was one of the five rivers of the Lower World, or Hades, in Greek and Roman mythology. In Greek legend, a drink of its waters made people forget everything that had happened before. The spirits of the dead drank from it before they entered Hades, and so forgot their worries on earth. The spirits that left Hades to live again in the Upper World drank so that they would not remember their joys in the Lower World. A branch of Lethe flowed by the cave of Somnus, god of sleep.

The word *Lethe* is taken from the Greek word which means *forgetfulness.* Padraic Colum

See also Hades.

LETO. See Apollo; Diana.

LETT is a descendant of the Letgali, who occupied the eastern half of present-day Latvia before A.D. 1200. The Letts live in Latvia, Lithuania, Estonia, and Germany. Many have migrated to the United States.

The Letts were originally a Nordic people, but they have mixed with the Baltic peoples around them so completely that they are now classed in the East Baltic group. In color, they are as light as many Swedes and Norwegians. Many Letts have straight blond hair and pure blue or gray eyes. Round heads, broad foreheads, and narrow noses are other distinguishing features.

The Lettish language is rhythmical and pleasing to the ear. The poetry of the Letts has the fire and vigor of primitive literature, and is full of the spirit of their warlike past. Wilton Marion Krogman

See also Latvia (The People).

LETTER OF CREDIT permits a traveler to draw money from foreign banks. The traveler "buys" the letter by depositing a certain sum of money or arranging a loan with his own bank. The letter says that the home bank will repay the foreign bank up to the sum stated.

Some letters of credit are addressed only to one banker. Tourists prefer the *circular* letter, which is good in almost any part of the world. The foreign banker pays in the current rate of exchange and writes the amount on the letter. If the traveler does not withdraw all the money for which he is guaranteed, the balance is returned to him by the bank that issued the letter.

Letters of credit are provided with reasonable identification of the owner. If lost, they have no value to the person who finds them. Robert W. Merry

See also Exchange; Traveler's Check.

Elizabeth Hibbs

Writing Letters helps bring friends closer together. A letter is actually a conversation in written words. It can tell a great deal about the writer's personality and interests.

Letter Writing

LETTER WRITING is a way of talking in written words. Any letter you write, just like your conversation, can tell much about your personality. It shows whether you think clearly and express yourself well, and whether you are considerate and courteous.

In every letter you write, you have a chance to make a good impression, a poor impression, or no impression at all. Your letters will make a good impression if you use correct English, choose words that express your ideas clearly and forcefully, show a good understanding of your subject, and write in a readable and sincere style. Your letters will make a poor impression if they are ungrammatical, jumbled in thought, careless, or stiff and dull. And the reader will probably think that you are neither interesting nor intelligent.

People write letters for both business and personal reasons. Business letters include letters of application, sales letters, credit and collection letters, and public-relations letters. Personal letters include "thank you" letters, letters of invitation, letters of congratulation, letters of sympathy, and letters of introduction. Both business and personal letters can play an important part in a person's life. For example, a good letter of application may lead to a fine position and a successful business career. A good personal letter can help build or keep a valuable friendship.

The Seven "C's" of a Good Letter

Seven "C" words describe a good letter. They are *clear, correct, complete, courteous, concise, conversational,* and *considerate.* Test your letter as you write to see that it fits these seven "C's."

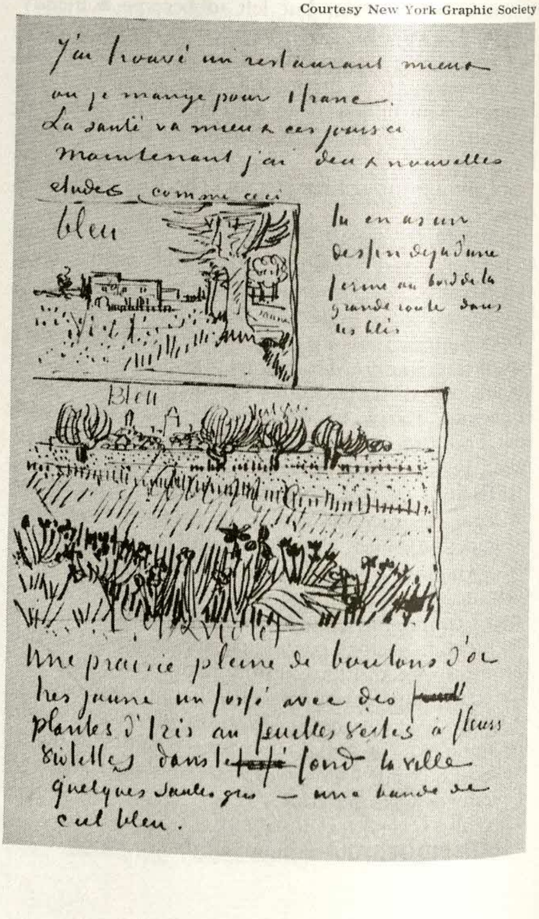
Clear. The best way to tell your reader what you want him to know is to plan your letter before you begin to write it. First, decide what you wish to say. Next, plan the *thought sequence,* or arrangement, of your ideas Finally, decide how best to express these ideas, and put your message on paper. Use simple, direct statements rather than long, involved sentences. Make every statement easy for your reader to understand.

Correct. Business firms write thousands of letters every day just to clear up mistakes they made in previous letters. These follow-up letters would not be necessary if writers would take the time to give all the necessary facts correctly in their first letters.

Before you write a letter, find out all you need to know about your subject. Be sure that every statement you make is correct. Do not guess. If you have any doubt about something you wish to write, check your information before you write it. Correct English and grammar are the basic tools of good writing. You can best express your thoughts and personality by arranging words properly and punctuating them correctly. Watch your grammar and spelling.

Complete. Include all the information in your letter that you think your reader might need. Your letter may

Courtesy New York Graphic Society



J'ai trouvé un restaurant mieux
où je mange pour 1 franc.
La santé va mieux ces jours ci
maintenant j'ai deux nouvelles
études comme ceci

Tu en as un
dessin déjà d'une
ferme au bord de la
grande route dans
les blés

bleu
Bleu
violet

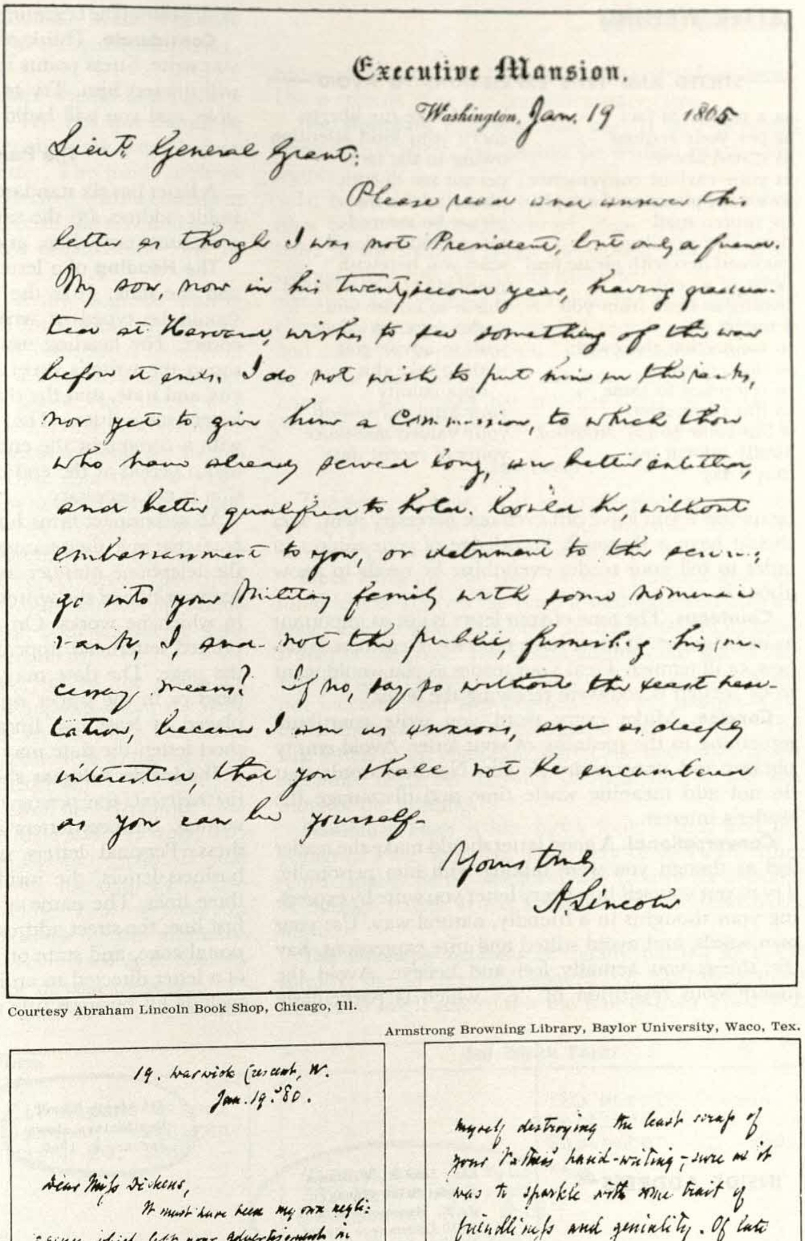
Une prairie pleine de boutons d'or
très jaune un fossé avec des ~~[illegible]~~
plantes d'Iris aux feuilles vertes à fleurs
violettes dans le ~~[illegible]~~ fond la ville
quelques saules gris — une bande de
ciel bleu.

Some Famous Letters

Abraham Lincoln Wrote to General U. S. Grant in January, 1865, asking if the general could find a place for Robert Lincoln in his "military family with some nominal rank, I, and not the public, furnishing his necessary means." Grant did.

Vincent van Gogh Wrote to his brother Theo, including sketches as parts of many letters. "Just now I have done two new studies like these: you have a drawing of one of them already." He marked blue, green, yellow, and violet on them.

Robert Browning Wrote to Mary Dickens, daughter of the novelist Charles Dickens, who had advertised for copies of letters from her father. Browning had "two short but characteristic letters. I will look for, and send them to you gladly."



Executive Mansion.

Washington, Jan. 19 1865.

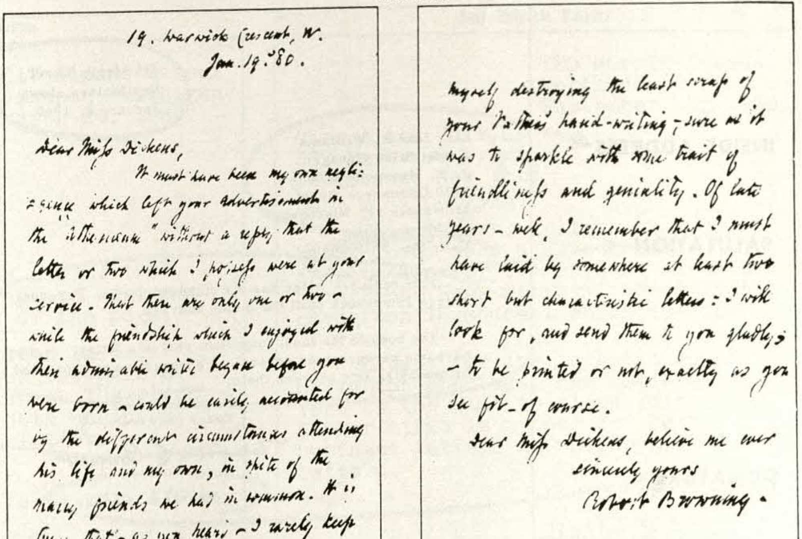
Lieut. General Grant:

Please read and answer this letter as though I was not President, but only a friend. My son, now in his twentysecond year, having graduated at Harvard, wishes to see something of the war before it ends. I do not wish to put him in the ranks, nor yet to give him a commission, to which those who have already served long, are better entitled, and better qualified to hold. Could he, without embarrassment to you, or detriment to the service, go into your Military family with some nominal rank, I, and not the public, furnishing his necessary means? If no, say so without the least hesitation, because I am as anxious, and as deeply interested, that you shall not be encumbered as you can be yourself.

Yours truly

A. Lincoln

Courtesy Abraham Lincoln Book Shop, Chicago, Ill.



19. Warwick Crescent, W.
Jan. 19th '80.

Dear Miss Dickens,

It must have been my own negligence which left your advertisement in the "Athenæum" without a reply that the letter or two which I possess were at your service. That there are only one or two—while the friendship which I enjoyed with their admirable writer began before you were born—could be easily accounted for by the different circumstances attending his life and my own, in spite of the many friends we had in common. It is true that—as you heard—I rarely keep letters in general: but I cannot fancy myself destroying the least scrap of your Father's hand-writing—sure as it was to sparkle with some trait of friendliness and geniality. Of late years—well, I remember that I must have laid by somewhere at least two short but characteristic letters: I will look for, and send them to you gladly,—to be printed or not, exactly as you see fit—of course.

Dear Miss Dickens, believe me ever
sincerely yours
Robert Browning.

Armstrong Browning Library, Baylor University, Waco, Tex.

STILTED AND TRITE EXPRESSIONS TO AVOID

as a matter of fact
as per your request
as stated above
at your earliest convenience
await the pleasure of a reply
by return mail
deem it a privilege
enclosed herewith please find
favor of a reply
hoping to hear from you
I might say
in connection therewith
in due course
in reference to same
in this connection
it has come to my attention
kindly inform me
may I say
may I take the liberty
merit your kind attention
owing to the fact
permit me to state
please advise me
please be assured
please find enclosed
send you herewith
thanking you in advance
this is to advise you
under separate cover
wish to advise you
wish to take this opportunity
your kind permission
your valued assistance
yours of recent date

be useless if you leave out even one necessary item. You should have a thorough knowledge of your subject in order to tell your reader everything he needs to know about it.

Courteous. The tone of your letter is just as important as its language. It must have no trace of curtness, rudeness, or ill temper. Treat your reader as you would want to be treated if you were receiving the letter.

Concise. Make every word you write contribute something to the meaning of your letter. Avoid empty phrases and unnecessary details. Needless words that do not add meaning waste time and discourage the reader's interest.

Conversational. A good letter should make the reader feel as though you were talking with him personally. Try to put yourself into every letter you write by expressing your thoughts in a friendly, natural way. Use your own words, and avoid stilted and trite expressions. Say the things you actually feel and believe. Avoid the monotonous repetition of "I," which is particularly noticeable at the beginnings of sentences and paragraphs.

Considerate. Think of the reader's point of view as you write. Stress points in your message that you know will interest him. Try to be helpful in every way possible, and you will build confidence and good will.

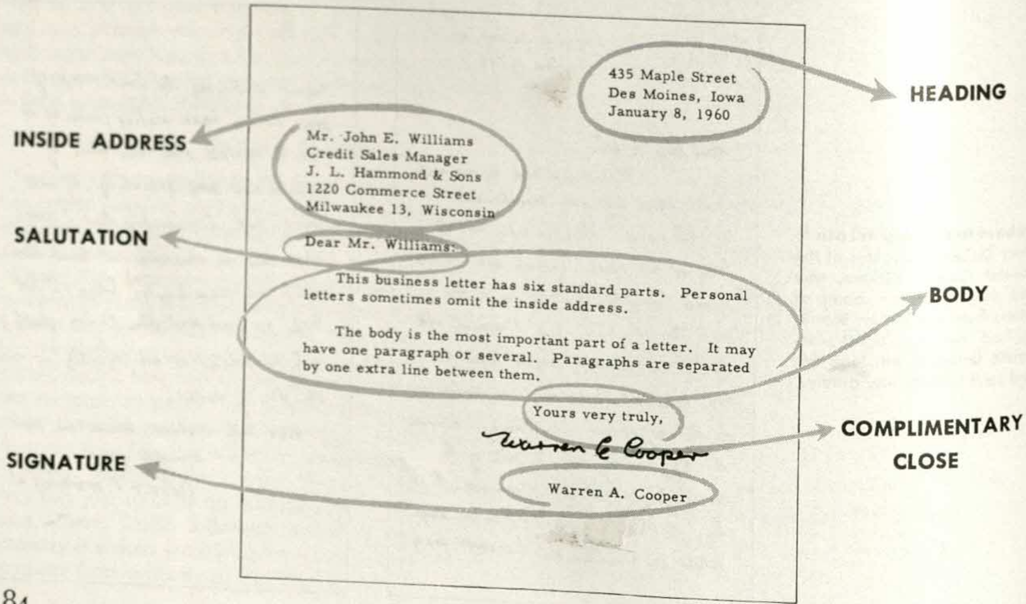
The Parts of a Letter

A letter has six standard parts: (1) the heading, (2) the inside address, (3) the salutation, (4) the body, (5) the complimentary close, and (6) the signature.

The Heading of a letter includes the writer's address and the date. It is the first thing on the page, and should be typed or written in the upper right-hand corner. The heading usually has three lines. The first shows the writer's street address, the second gives the city and state, and the third tells the date on which the letter was written. The heading may be punctuated with a comma at the end of each of the first two lines and a period at the end of the third, but this punctuation is not necessary.

Most business firms have printed or engraved *letterheads* that give their names and addresses. Many include the telephone number as well. Some also include the name or title of the writer, or the department or section in which he works. On most business stationery, the printed letterhead appears in the center at the top of the page. The date may be typed beneath the letterhead or in the upper right-hand corner. It should be placed at least two lines below the letterhead. In a short letter, the date may be placed even lower.

The Inside Address shows the name and address of the *recipient*, the person or firm to whom the letter is written. Business letters always include an inside address. Personal letters need not have it. In many business letters, the inside address can be written in three lines. The name of the recipient appears on the first line; the street address on the second; and the city, postal zone, and state on the third. The inside address of a letter directed to an individual in his office should include his business title and the name of his firm. All



435 Maple Street
Des Moines, Iowa
January 8, 1960

Mr. John E. Williams
Credit Sales Manager
J. L. Hammond & Sons
1220 Commerce Street
Milwaukee 13, Wisconsin

Dear Mr. Williams:

This business letter has six standard parts. Personal letters sometimes omit the inside address.

The body is the most important part of a letter. It may have one paragraph or several. Paragraphs are separated by one extra line between them.

Yours very truly,

Warren E Cooper

Warren A. Cooper

names and titles should be written out in full. The only abbreviations permissible are *Mr.*, *Esq.*, *Messrs.*, *Mmes.*, *Mrs.*, *Dr.*, *Rev.*, and *Hon.*

Each line of the inside address should begin at the left-hand margin of the letter. The first line should be placed at least two lines lower than the date. It may be placed lower in a short letter. The inside address, like the heading, may be punctuated with a comma at the end of each of the first two lines and a period at the end of the third line, or this punctuation may be omitted.

The Salutation, or greeting, should begin at the left-hand margin of the letter, two lines below the last line of the inside address. Avoid the impersonal *Dear Sir* or *Dear Madam* when writing to a business acquaintance or to an older person. Use the person's last name, such as *Dear Mr. Walton* or *Dear Mrs. White*. Use *Gentlemen* in writing to a company. Address a friend by his first name or nickname, such as *Dear Paul* or *Dear Peggy*. Use a colon after the salutation in a business letter, and a comma in a personal letter. See Address, Form of.

The Body is the most important part of a letter. It consists of whatever you want to say. In a typewritten letter, the body should begin two lines below the salutation. All paragraphs within the body should be separated by one extra line between them.

The Complimentary Close. Just as the salutation greets the reader at the beginning of a letter, the complimentary close says good-by at the end. These two parts of the letter should be consistent as to the degree of formality or informality they express.

If you greet the reader as *Dear Mr. Gordon* or *Dear Mrs. Martin*, you can close with *Yours very truly*, *Very truly yours*, *Sincerely yours*, or *Cordially yours*. If your salutation is *Dear Bob*, you may use *Sincerely* or *Cordially* as the complimentary close. *Yours very truly* or *Very truly yours* are proper closings for the salutation *Gentlemen*. You may also use *Yours sincerely* or *Sincerely yours* if these forms suit the tone of your message.

Place the complimentary close in the right-hand corner of the page, two lines below the body of the letter. Use a comma after the complimentary close.

The Signature tells who you are. It is a personal element in a letter, and should be written neatly and legibly in ink.

In typewritten letters, type your name four or five lines below the complimentary close. Then sign the letter in the space between the closing and the typewritten signature. In handwritten letters, place your signature two or three lines below the complimentary close. A married woman should sign her legal name and add Mrs. in parentheses to the left of her name, as in *(Mrs.) Mary Smith*. Or, she may add her married name in parentheses beneath her legal name, as in *Mary Smith* with *(Mrs. John Smith)* written beneath it.

The Form

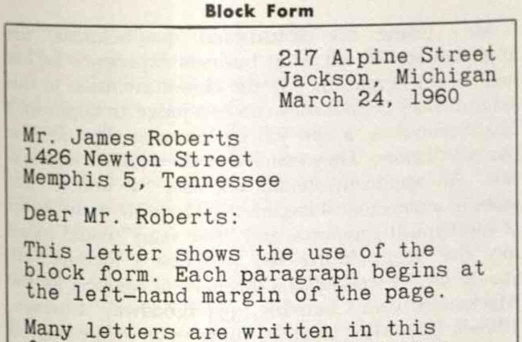
The *form*, or style, of a letter depends on the way the six parts of the letter are put together. The most common forms are *block* and *semiblock*.

Block Form may be used for both business and personal letters. It gives the page a well-balanced appearance. The heading is placed in the upper right-hand corner of the page. The inside address and the salutation begin at the left-hand margin. New paragraphs are not indented, but also begin at the left margin. One extra line separates each paragraph from the next. The first letters of the complimentary close and of the typed signature begin on the same vertical line as the first letter of the heading.

Semiblock Form is like block form except that the paragraphs are indented. They may be indented either 5 or 10 spaces. Semiblock form may be used for personal or business letters. It has a less formal tone than block form.

The Envelope Address is usually written in block form. It should be double-spaced if it has two or three lines, and single-spaced if it has four or more lines. The

Block Form



217 Alpine Street
Jackson, Michigan
March 24, 1960

Mr. James Roberts
1426 Newton Street
Memphis 5, Tennessee

Dear Mr. Roberts:

This letter shows the use of the block form. Each paragraph begins at the left-hand margin of the page.

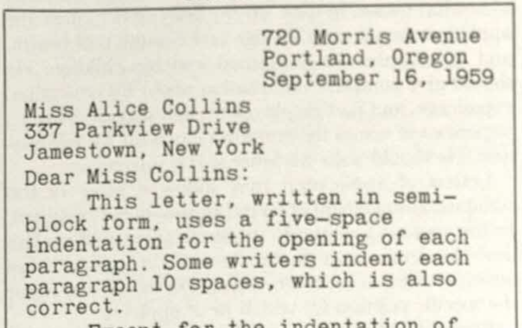
Many letters are written in this form, because it gives the page a well-balanced appearance. The block form is correct for both business letters and personal letters.

Yours very truly,

Allen E. Parker

Allen E. Parker

Semiblock Form



720 Morris Avenue
Portland, Oregon
September 16, 1959

Miss Alice Collins
337 Parkview Drive
Jamestown, New York

Dear Miss Collins:

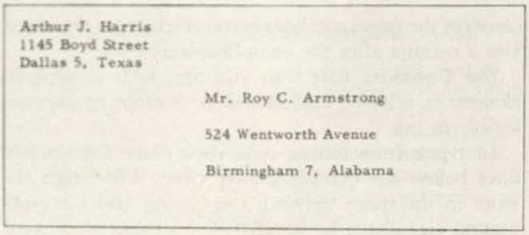
This letter, written in semiblock form, uses a five-space indentation for the opening of each paragraph. Some writers indent each paragraph 10 spaces, which is also correct.

Except for the indentation of paragraph openings, the semiblock form is the same as block form. Either style is proper for both business letters and personal letters.

Yours very truly,

Walter H Evans

Walter H. Evans



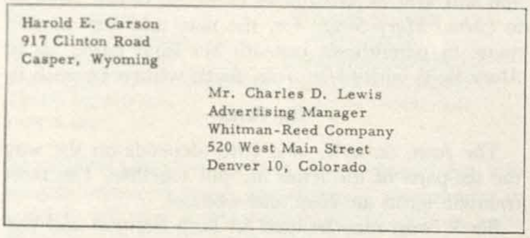
Arthur J. Harris
1145 Boyd Street
Dallas 5, Texas

Mr. Roy C. Armstrong

524 Wentworth Avenue

Birmingham 7, Alabama

The Envelope Address is double-spaced if it has two or three lines. It is single-spaced if it has four lines or more.



Harold E. Carson
917 Clinton Road
Casper, Wyoming

Mr. Charles D. Lewis
Advertising Manager
Whitman-Reed Company
520 West Main Street
Denver 10, Colorado

writer's return address should be single-spaced and placed in the upper left-hand corner of the envelope.

Business Letters

There are many kinds of business letters, but the same principles of good writing apply to all. Every good business letter is also a sales letter. It tries to sell a product, a service, or an idea to a reader. For example, a letter of application tries to sell the services of an applicant to an employer. A collection letter is written to "sell" a debtor on the idea of paying his bill. To do its job well, a business letter must be interesting and convincing to the reader.

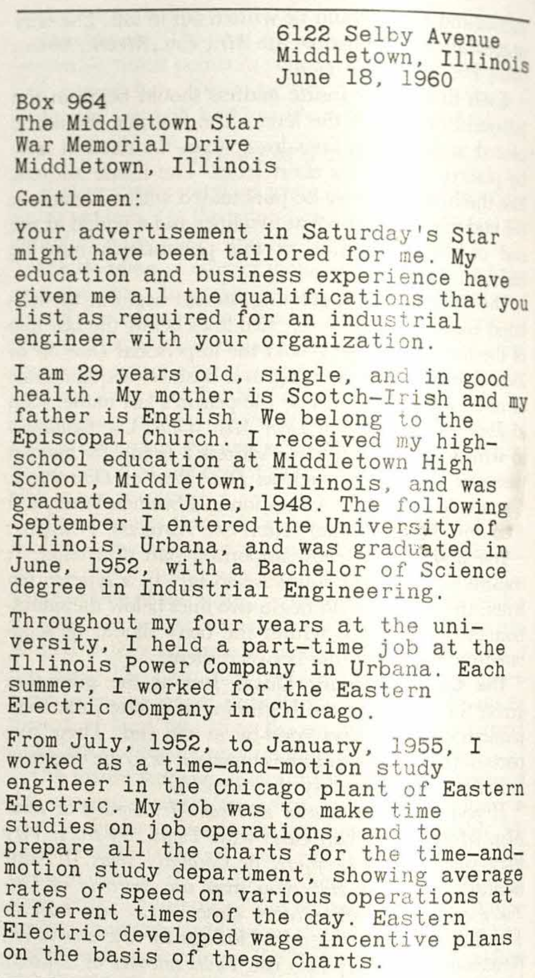
Letters of Application. Every person who must earn a living should know how to write a good letter of application. The quality of the letter may mean the difference between getting or not getting a good job.

A letter of application should be respectful and somewhat formal in tone. In the body of the letter, the applicant should state his age and condition of health, and tell whether he is married and has children. He should give complete information about his education, experience, and past employment, and suggest *references*, or persons to whom the employer can write for information. He should write his letter so it is interesting.

Letters of application may follow a more or less standard arrangement of facts, but should not be stilted. In the opening paragraph, the applicant should explain how the letter came to be written—in answer to an advertisement, or for other reasons. He should also name the specific position for which he is applying.

Personal information, such as age, marital status, and condition of health, belong in the second paragraph. The applicant should give his exact age.

Next come his educational qualifications. Employers prefer specific information. An employer cannot get a clear idea of an applicant's qualifications from such a statement as "I am a college graduate." But he knows that the applicant has considerable knowledge of engineering when he reads, "I received my degree in civil engineering from the University of Illinois in 1960."



6122 Selby Avenue
Middletown, Illinois
June 18, 1960

Box 964
The Middletown Star
War Memorial Drive
Middletown, Illinois

Gentlemen:

Your advertisement in Saturday's Star might have been tailored for me. My education and business experience have given me all the qualifications that you list as required for an industrial engineer with your organization.

I am 29 years old, single, and in good health. My mother is Scotch-Irish and my father is English. We belong to the Episcopal Church. I received my high-school education at Middletown High School, Middletown, Illinois, and was graduated in June, 1948. The following September I entered the University of Illinois, Urbana, and was graduated in June, 1952, with a Bachelor of Science degree in Industrial Engineering.

Throughout my four years at the university, I held a part-time job at the Illinois Power Company in Urbana. Each summer, I worked for the Eastern Electric Company in Chicago.

From July, 1952, to January, 1955, I worked as a time-and-motion study engineer in the Chicago plant of Eastern Electric. My job was to make time studies on job operations, and to prepare all the charts for the time-and-motion study department, showing average rates of speed on various operations at different times of the day. Eastern Electric developed wage incentive plans on the basis of these charts.

A Letter of Application tries to "sell" an applicant to an employer. It should be neat, respectful, and informative.

After listing his educational qualifications, the applicant should tell what business experience he has had. Many employers pay the closest attention to this section. They believe they can best judge an applicant's qualifications for a new job by knowing what jobs he has held before. They usually prefer detailed information. An applicant should not say, "I worked five years as a mechanical engineer." There are many kinds of mechanical engineers, and "five years" could mean any five years during the applicant's lifetime. He should say, "I worked as a mechanical engineer for the Mechanical Can Company, 333 Broadway, Chicago, Illinois, from May, 1952, to June, 1957. While there, I supervised a staff of 30 skilled mechanics. It was our job to maintain perfect operation of all the machinery in the can-manufacturing plant, which covers more than three acres."

If an applicant writes that he was in charge of several other workmen, an employer will know that he has had supervisory experience as well as engineering experience. Sometimes an applicant finds it helpful to mention the salary he received in previous jobs. If he says he received $10,000 a year as a mechanical engineer,

---

Box 964, The Middletown Star, Page 2,
June 18, 1960

Since January, 1955, I have worked as plant-layout engineer for the Wilmot Electrical Manufacturing Company in Middletown. My duties cover the layout of the entire plant, from the arrangement of machinery in the assembly room to the plan of office arrangement in the typing department.

The following persons have known me for more than ten years. You may write to them concerning my character and ability.

Mr. Cecil B. Carson
Executive Vice-President
Eastern Electric Company
8310 West Haworth Street
Chicago 42, Illinois

Dr. Carter Smith
Department of Mathematics
216 Hollingsworth Hall
University of Illinois
Urbana, Illinois

The Reverend Robert Smith
St. Anthony's Episcopal Church
702 Montgomery Avenue
Champaign, Illinois

I hope that you will be as much interested in talking to me about the position you advertise as I am in learning more about it. May we discuss it at a time convenient for you? Enclosed is a stamped, addressed envelope for your reply. If you should wish to call me, my home telephone number is WEntworth 4-3621.

Yours very truly,

John C. Chalmers

John C. Chalmers

---

an employer will judge immediately that his job must have been important.

A list of references to whom the employer can write for information about the applicant's character, personality, ability, and experience should follow the details of employment. The list may be in table form. It should give the full names of the references, their addresses, telephone numbers, and positions. Acceptable references include former employers, ministers, physicians, and teachers. Not fewer than three persons, nor more than five, should be listed as references.

The last paragraph of a letter of application should be designed to get prompt and favorable action from an employer. It should request an interview, and make it easy for the employer to get in touch with the applicant. An applicant can make a favorable impression by enclosing an addressed, stamped envelope for the employer's reply. He should mention the envelope in the last paragraph. He should also give his telephone number so that the employer can arrange an interview by phone if he wishes.

Sales Letters are among the most important types of business correspondence. Firms usually send sales letters in series. They begin with an *opening* letter, then send several *follow-up* letters.

Whatever may be the purpose of the series, all good sales letters include certain elements. The opening paragraph must get the reader's attention and arouse his interest. It may do this by a challenging question or by a startling statement of fact. The following paragraphs must describe the article or the service for sale, and do so in terms of its benefit to the reader. The letter should also give the reader proof of the quality and reliability of the product or service to be sold. The last paragraph of the letter should be the "clincher".

Collection Letters. No business can succeed unless it receives payment for the goods or services it sells. Business firms write collection letters to get money from customers who have fallen behind in paying their bills. A collection letter should be designed to get the money as quickly as possible, without offending the customer. It should be courteous and understanding in tone, yet specific in its request for payment. It should mention the exact amount of the bill, and the length of time that payment has been past due.

Many companies send collection letters, like sales letters, in series. They usually make the first letter mild in tone. It simply reminds the customer of his past-due account and asks him to cooperate in paying it. Each succeeding letter becomes more firm in tone and more direct in its request for payment. Some companies find it effective to point out that, if a customer pays his account, he will maintain his sound credit standing with other businesses in the community.

Personal Letters

People generally use a more informal tone in personal letters than in business letters. In most cases, the writer knows his reader well, and writes on an informal subject.

The writer may omit the inside address. If he uses it, he may place it in the lower left-hand corner of the page, a few spaces below the signature and even with the left margin, or in the upper left-hand corner as in a business letter. A comma follows the salutation.

Following is an example of an informal personal letter.

---

237 Grant Street
Racine, Wisconsin
February 23, 1960

Dear Chuck,

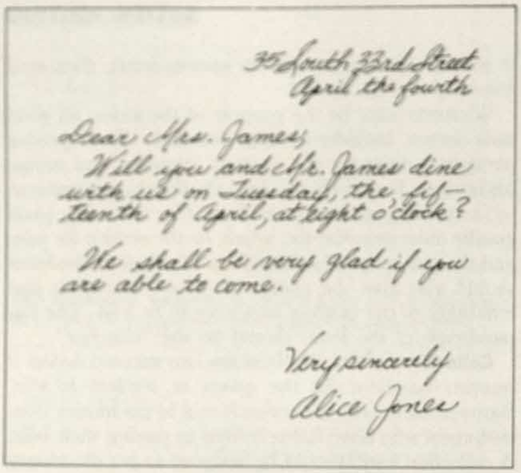
Spending last Thursday with you in Omaha was surely fun. Thank you for taking me to your club for such a good dinner, and for driving me to the airport afterward.

Be sure to let me know the next time you will be coming this way. I'll look forward to your visit, and also to the chance to return your hospitality.

Cordially,

Ken

Mr. Charles E. White
930 Nebraska Avenue
Omaha 3, Nebraska



35 South 33rd Street
April the fourth

Dear Mrs. James,
Will you and Mr. James dine with us on Tuesday, the fifteenth of April, at eight o'clock?

We shall be very glad if you are able to come.

Very sincerely
Alice Jones

Informal Invitation

Informal Invitations are written in the second person *(you)*. The date, new paragraphs, complimentary close, and signature should be indented. An acceptance or declining note should follow the same form as the invitation.

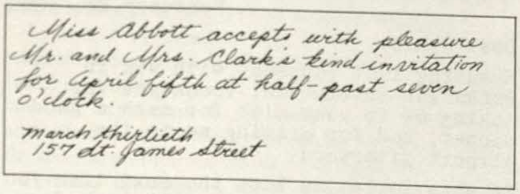
The letters *R.S.V.P.* may appear on both informal and formal invitations. The letters stand for the French phrase, *Répondez, s'il vous plaît*, which means *Answer, if you please*. An invitation may say *Please reply* or *The favor of a reply is requested* instead of R.S.V.P. Any request for a reply belongs in the lower left-hand corner of an invitation.

Formal Invitation

Mr. and Mrs. James Clark request the pleasure of Miss Abbott's company at dinner on the evening of April fifth, at half-past seven o'clock.

March twenty-eighth
15 Astor Place

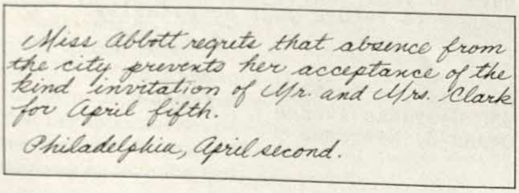
Acceptance



Miss Abbott accepts with pleasure Mr. and Mrs. Clark's kind invitation for April fifth at half-past seven o'clock.

March thirtieth
157 St. James Street

Declining



Miss Abbott regrets that absence from the city prevents her acceptance of the kind invitation of Mr. and Mrs. Clark for April fifth.

Philadelphia, April second.

Mr. and Mrs. Robert Hall
request the honour of your presence
at the marriage of their daughter
Beatrice Kay
to
Mr. James Hilton
on Sunday evening, the fifth of June
nineteen hundred and sixty
at eight o'clock
at the Westminster Memorial Church
Burnham Manor, New York

Formal Wedding Invitation

Formal Invitations are written in the third person (the individual's name, then *he*, *she*, or *they*). Wedding invitations are usually sent in the name of the bride's parents. The heading of a formal invitation should be placed below the body of the invitation. Its order should be reversed, with the date on the first line and the address on the second. The date should be spelled out. No signature is used in a formal invitation. Both formal and informal invitations may be handwritten or engraved, but never typed. W. H. BUTTERFIELD

Related Articles in WORLD BOOK include:

Address, Form of
Etiquette
Grammar
Handwriting
Invitations
Punctuation
Spelling

Outline

I. The Seven "C's" of a Good Letter
- A. Clear
- B. Correct
- C. Complete
- D. Courteous
- E. Concise
- F. Conversational
- G. Considerate

II. The Parts of a Letter
- A. The Heading
- B. The Inside Address
- C. The Salutation
- D. The Body
- E. The Complimentary Close
- F. The Signature

III. The Form
- A. Block Form
- B. Semiblock Form
- C. The Envelope Address

IV. Business Letters
- A. Letters of Application
- B. Sales Letters
- C. Collection Letters

V. Personal Letters
- A. Informal Invitations
- B. Formal Invitations

Questions

What are the seven characteristics of a good letter?

How should a salutation be punctuated in (1) a business letter? (2) a personal letter?

What are the six parts of a letter?

Where is the heading of a letter placed?

What does *R.S.V.P.* mean?

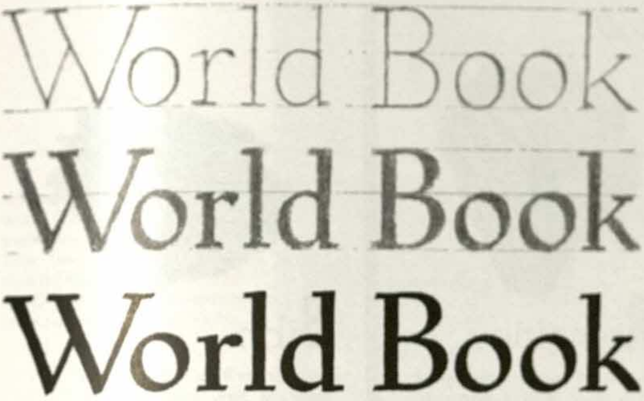
When are the following complimentary closes proper: (1) Yours very truly? (2) Cordially? (3) Sincerely yours?

How is the inside address of a business letter arranged?

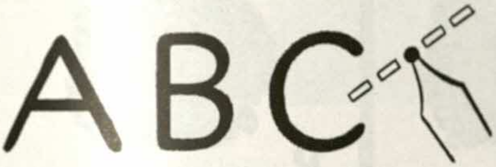
What information should be in the opening paragraph of a letter of application?

What purposes do sales letters serve?

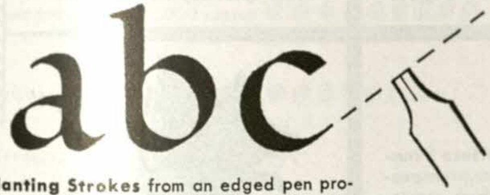
How should an envelope address be arranged if it has six lines?



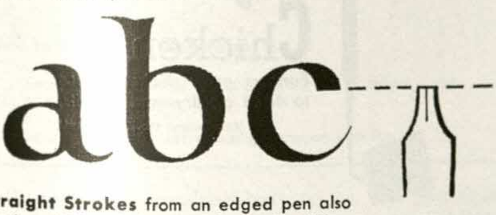
Lettering by Hand can be fun. First outline the letters with a pencil to give yourself the proper spacing. Use a guide line to make small letters the right size. Fill the letters in with pencil for thickness. Then ink them in.



A Round Point produces letters with even strokes, all the same size. These simple letters are good for displays and announcements.



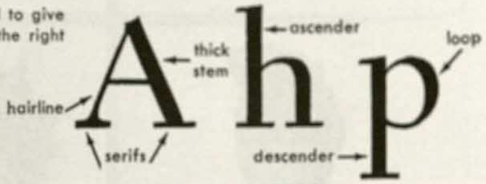
Slanting Strokes from an edged pen produce pleasing contrasts of thick and thin. The pen should always be held at a uniform slant.



Straight Strokes from an edged pen also produce thick and thin lines, but quite different from those made with slanting strokes.

LETTERING is an important creative art. It is widely used for inscriptions on buildings. When used with good taste, lettering lends distinction to the building it decorates. Hand lettering, or the proper use of standard letters, is an essential part of any program in the commercial arts.

In the Middle Ages, monks copied all manuscripts by hand. They spent much time designing large, complicated, colored initial letters. They called this *illumination* (see MANUSCRIPT [Illuminated]). Today the taste in letters has changed. Present-day alphabets are simply designed and easily read. Some of these alphabets are set in type so that they can be more widely used. But the finest lettering is still done by hand.



PARTS OF LETTERS

The first thing to consider in lettering is proper spacing. Good letterspacing does not mean that there is an equal distance between every two letters. It means that the white space between letters must seem equal to the eye. This is also true of the space within letters. For example, the letters G and O could be placed slightly closer together than the letters I and N.

The first job is to decide the space which the lettering is to fill. Lightly sketch in the letters on tracing paper. If they do not fit, the spacing or the proportion may be changed.

When you are satisfied with the lettering on tracing paper, you are ready to transfer it to a good piece of paper or board. Trace only the outline of the letter. Now go over your letters with a pencil to build them up to the weight or heaviness that you want. Here you have the chance to correct any mistakes you may have made on the tracing paper. It is important that this pencil drawing be accurate. The ink goes directly over the pencil line except on the slanting or diagonal strokes. These are done a little thinner to keep the letter from becoming too heavy where the strokes join.

Ink all vertical strokes first, diagonal second, and horizontal last. If there are any rough edges remaining they can be touched up with a little white paint. But one should not depend on this to hide poor work.

There are many styles of alphabets from which to choose. *Block* can be used for bold posters. *Script* gives a certain dash and freedom to the letters. *Old-fashioned* or *Gothic* suggests quality and quaintness. There is an appropriate style of letter for every variety of work that calls for lettering.

WILLIAM M. MILLIKEN

See also ALPHABET; COMMERCIAL ART; HANDWRITING; POSTER; WRITING.

LETTERS OF JUNIUS. See JUNIUS LETTERS.

LETTERS OF MARQUE. See MARQUE AND REPRISAL; PRIVATEER.

LETTERS OF THE ALPHABET. See ALPHABET; and the separate articles on each letter.

Iceberg

Heads of crisp iceberg lettuce are on the market all year.

Romaine

Leaves of romaine curl inside each other to form long rolls.

Bibb

Dark green Bibb lettuce leaves grow in tiny, loose clusters.

Celtuce

Celtuce combines the uses and flavors of lettuce and celery.

Leaf

Home gardeners find lush leaf lettuce the easiest to grow.

Boston

Tasty Boston lettuce forms loose, partially folded heads.

Crisp Green Lettuce is combined with tomatoes, green peppers, and other fresh vegetables to make delicious salads.

Courtesy *Better Homes & Gardens* Magazine

Chicken

Farmers grow chicken lettuce to feed poultry and rabbits.

The Kroger Co., Cincinnati

LETTUCE is the most popular salad plant, and has been used for food since before the beginning of the Christian Era. It is native to the Middle East. The first lettuce was probably the *loose-leaf* type, followed by *cos*, or *romaine*, lettuce, which has long, narrow leaves that curl inside one another to form a long roll. Cos lettuce forms a tall, loose head, and is prized for its flavor. *Head* lettuce developed later.

Head lettuce is more difficult to raise than leaf lettuce. Only a few areas can grow it throughout the year. Cool temperatures and short hours of sunshine are essential to produce solid heads. There are two types of head lettuce, *crisp* and *butter-head*. Most lettuce is crisp lettuce. The butter-head type forms a smaller head, and has waxy or buttery leaves. For these reasons, butter-head lettuce has a better quality than crisp lettuce.

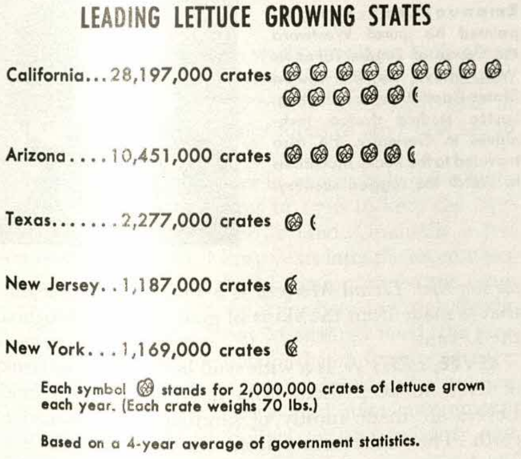
Some lettuce for the home garden must first be planted in a greenhouse, and later transplanted outdoors as seedlings. The crop can be harvested after two and a half or three months.

Practically all commercial lettuce is seeded directly in the field, and later thinned out so the plants are about a foot apart. Much commercial lettuce in the United States comes from the Salinas Valley in California. Lettuce planted there on July 1 requires 65 days to the first harvest. Lettuce planted on November 21 requires 142 days. The field is harvested two or three times, and the heads are selected according to their hardness.

Most lettuce is packed in cardboard containers right

Commercial Lettuce Growers in California cut, trim, and pack the crisp heads in the field. The boxes of lettuce go from the truck farms to railroad refrigerator cars to be shipped to all parts of the United States.

Western Ways



LEADING LETTUCE GROWING STATES

Each symbol stands for 2,000,000 crates of lettuce grown each year. (Each crate weighs 70 lbs.)

Based on a 4-year average of government statistics.

in the field. The containers have no ice. The packages pass through a tunnel for cooling, then are loaded into refrigerator cars. Some lettuce is packed in crates between layers of ice.

Lettuce is a popular food because it contains few calories, but still provides bulk in the diet. It also has large amounts of vitamins A and B.

Scientific Classification. Lettuce is in the family *Compositae.* It is genus *Lactuca,* species *sativa.* There are several varieties. Head lettuce is variety *capitata.* Cos, or romaine, lettuce is variety *longifolia.* Leaf lettuce is variety *crispa.* John H. MacGillivray

See also Vegetable (Planting Table for Vegetables).

LEU, *LEH oo,* is a standard silver coin of Romania. The plural is *lei.* It was formerly a gold coin. The leu equals 100 bani. For the value of the leu, see Money (table, Values of Monetary Units).

LEUCIPPUS. See Democritus.

LEUCOCYTE, *LYOO koh site,* and **LEUCOCYTOSIS.** Leucocytes are white blood corpuscles. The body uses them to fight infection and disease. *Leucocytosis* is a blood condition caused by having too many white blood corpuscles.

See also Blood (White Blood Cells).

LEUCTRA, BATTLE OF. See Sparta.

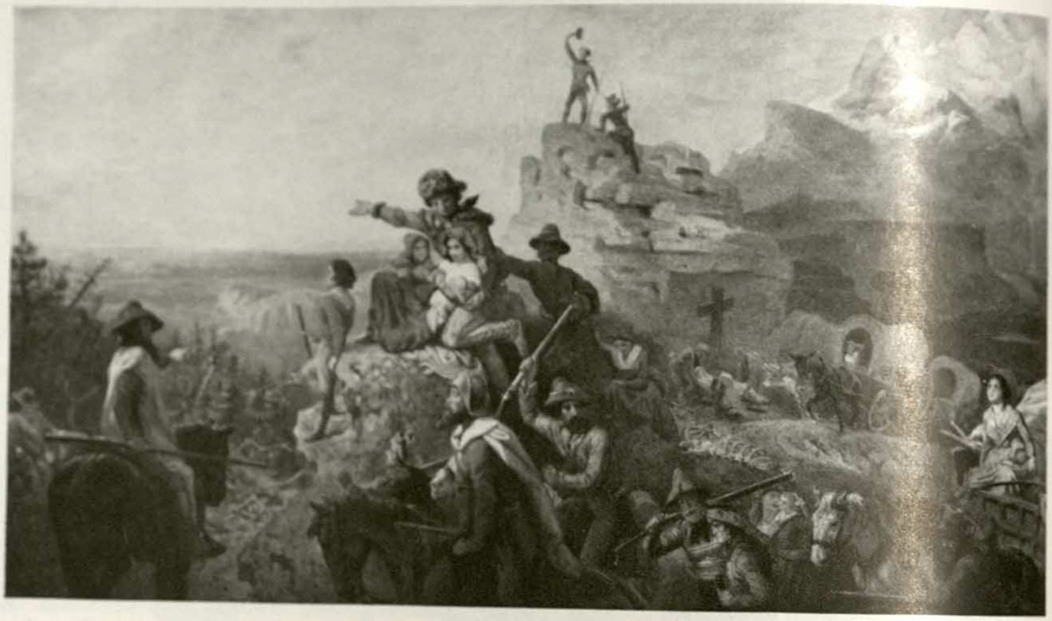
LEUKEMIA, *lyoo KEE mih uh,* is a serious disease of the white cells of the blood. The disease results in a purposeless, continual growth of white blood cells. Scientists believe that leukemic cells may have lost enzymes that regulate their growth. Therefore, the *metabolism,* or life processes, of these cells goes on without any regulation, and the tissues reproduce rapidly.

There are four different kinds of white cells in the body: granulocytes, lymphocytes, monocytes, and plasmocytes. Doctors classify leukemia according to the kind of cells it affects. Any of the four kinds may be acute or chronic. In *acute leukemia,* the overgrowth of cells is exceedingly rapid. Anemia develops quickly. In *chronic leukemia,* the cells multiply more slowly, but anemia also develops eventually. Once anemia develops, the patient enters the most serious phase of the disease. See Anemia.

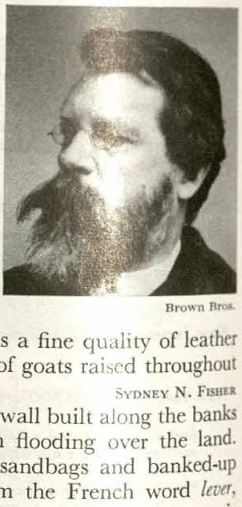
Causes of Leukemia. Scientists know that persons who have been exposed to excessive radiation are more likely to get leukemia than are other individuals. Such radiation may result from X rays or exposure to atomic bomb radiation. Investigators also believe that certain chemicals and viruses may cause leukemia.

Treatment. Doctors use various means to produce periods of temporary improvement. But there is no known cure for the disease. Blood transfusions, cortisone, and certain chemicals called *antimetabolites* may be useful in retarding the disease. However, the abnormal growth eventually returns, and causes the death of the patient. William Dameshek

See also Cancer.



Smithsonian Institution



Emanuel Leutze, *right,* painted his mural *Westward the Course of Empire Takes Its Way, above,* for the United States Capitol. Before starting, Leutze studied fresco techniques in Germany. He also traveled to the Rocky Mountains to sketch the rugged scenery.

Brown Bros.

LEUTZE, *LOIT suh,* **EMANUEL GOTTLIEB** (1816-1868), gained fame as a painter of American historical subjects. His best-known work is *Washington Crossing the Delaware,* owned by the Metropolitan Museum of Art in New York City. He painted his masterpiece in Germany, using the Rhine as a model for the Delaware. In 1860, Congress commissioned him to paint a mural for the U.S. Capitol, *Westward the Course of Empire Takes Its Way.* Leutze was born at Gmünd, Germany, and studied art in Philadelphia. In 1859, he settled in New York.

JOHN D. MORSE

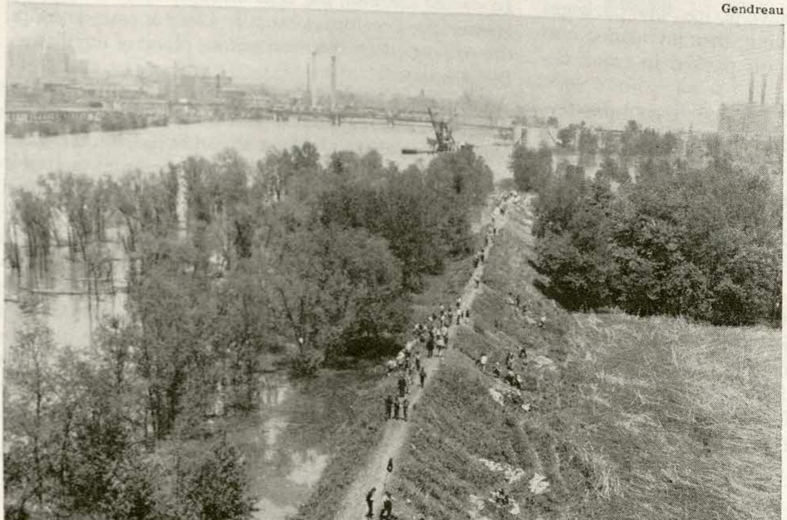
LEV, *lehf,* is the gold monetary unit of Bulgaria. The lev (plural, *leva*) equals 100 stotinki. For the value of a lev, see MONEY (table, Values of Monetary Units).

LEVANT, *lee VANT,* is the land at the eastern end of the Mediterranean Sea. It includes the coast region and islands of Asia Minor and Syria. The Levant is sometimes considered as extending east to the Euphrates River and through the Nile Valley, and including Greece and Egypt. The name *Levant* is a French word that means *rising,* and which originally meant *the place where the sun rises. Levant Morocco* is a fine quality of leather that is made from the skins of goats raised throughout the Levant.

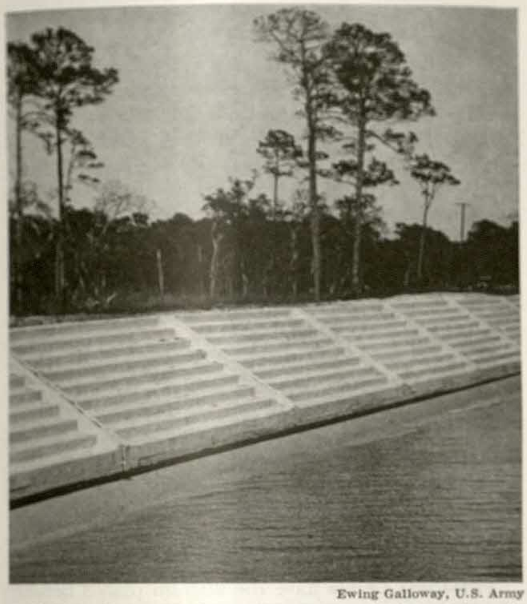
SYDNEY N. FISHER

LEVEE, *LEHV ee,* is a wide wall built along the banks of rivers to keep them from flooding over the land. Levees are made mostly of sandbags and banked-up earth. The name comes from the French word *lever,* which means *to raise.* In the United States, the term is

Gendreau



Levees are wide walls built to keep rivers from flooding adjacent land. When rivers rise, levees must sometimes be built higher with sandbags, as the workers, *left,* are doing on a Mississippi River levee.



Ewing Galloway, U.S. Army

A Sloping Concrete Levee protects the Mississippi shore line along the Gulf of Mexico, *left.* Temporary wood levees contained the Missouri River in Omaha, Nebr., during a 1952 flood, *top right.* The cross section of a concrete wall, *above right,* shows a modern flood control method.

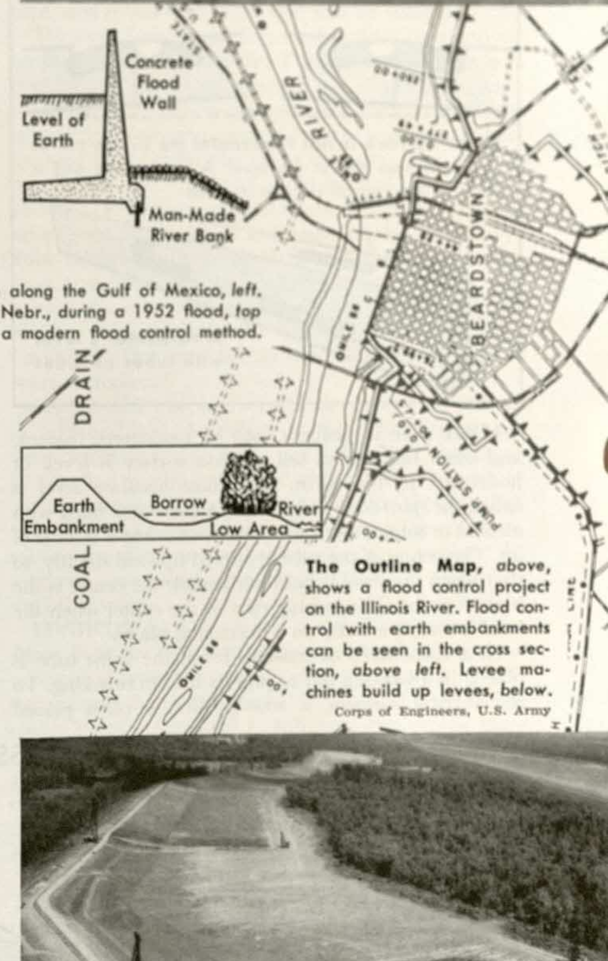
used especially to describe walls, or dikes, built along the southern part of the Mississippi River. Irrigation engineers use the term *levee* to describe a small dike or ridge of earth which confines areas of land that are to be flooded for agricultural purposes.

The first Mississippi River levee was only 3 feet high. It was built at New Orleans in 1718 to keep the river from flooding a strip of fertile land. Gradually a few more levees were built. Many years later the seven states that lie south of where the Mississippi meets the Ohio asked the federal government for help to check floods. In 1882, the year of a great Mississippi flood, the government set aside $1,300,000 for the improvement of the river. Part of the money was to be used for making levees. Since then the federal and state governments have spent millions of dollars for the building and repairing of levees.

The earth embankments on the Mississippi are 15 to 30 feet high. They are 8 feet wide on top, and the sides slope to a wedge of over 100 feet at the base. More than 2,000 miles of levees have been built along the Mississippi, but they still do not fully control the overflow. The completed program will have 2,500 more miles of levees. About 1,500 miles of the total planned length of the levees have been built since 1905. Some authorities object to the building of levees that enclose a river so much that the water is high above the surrounding countryside. This makes floods even more dangerous when they occur. If a levee were to break under these circumstances, a wall of water would suddenly rush across the countryside, smashing everything in its way. Experts who oppose high levees believe that regulating floods by headwater control is better than attempting to regulate them with levees.

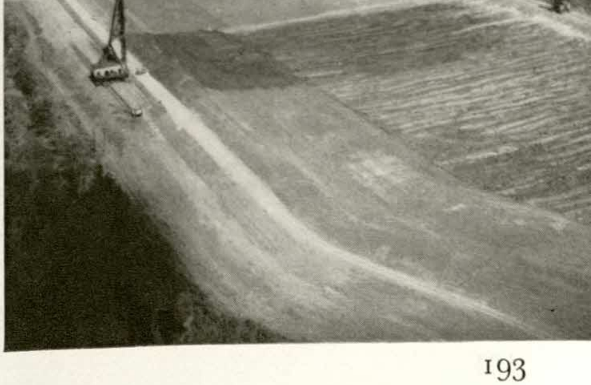
ALLAN T. GIFFORD

See also FLOODS AND FLOOD CONTROL; JETTY; MISSISSIPPI RIVER.

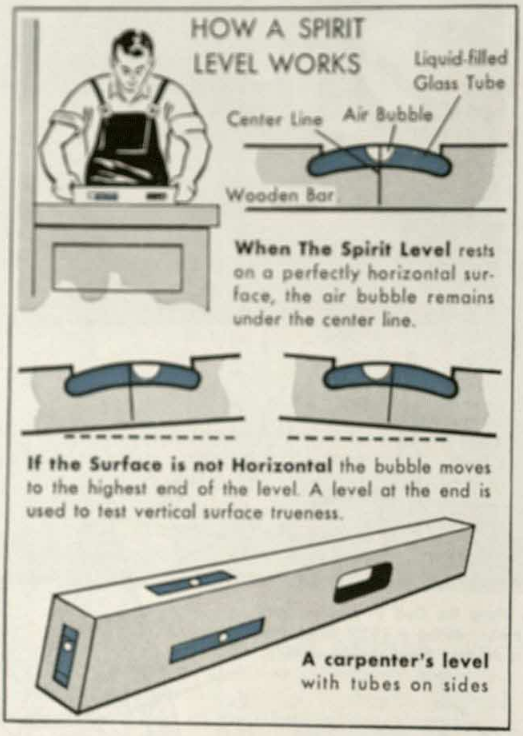


The Outline Map, *above,* shows a flood control project on the Illinois River. Flood control with earth embankments can be seen in the cross section, *above left.* Levee machines build up levees, *below.*

Corps of Engineers, U.S. Army



HOW A SPIRIT LEVEL WORKS



When The Spirit Level rests on a perfectly horizontal surface, the air bubble remains under the center line.

If the Surface is not Horizontal the bubble moves to the highest end of the level. A level at the end is used to test vertical surface trueness.

A carpenter's level with tubes on sides

LEVEL is an instrument used by carpenters, masons, and other builders to tell when a surface is level, or horizontal to the earth. The most accurate level is called the *spirit level*. It is simply a glass tube filled with alcohol or some other spirit, and containing a bubble of air. The center of the tube is curved upward slightly, so that when the level is held horizontal, the center is the highest point. The bubble rises to the center when the level is resting exactly on a horizontal plane.

In a carpenter's or mason's level, the spirit tube is placed in a wooden bar to protect it from breaking. To test vertical surfaces, a second tube is often placed across the end of the bar and at right angles to the long dimension. When using such a level, carpenters reverse it end-for-end after the first test. If the bubble is at the center line in both tests, the level is accurate. An older form of carpenter's level was a plumb line fastened to a T-shaped frame. When the line hung parallel with the stem of the T, the cross-bar was known to be horizontal. A surveyor's leveling instruments usually have a spirit level fastened parallel to a telescopic sight. HERMAN J. SHEA

LEVER, *LEE ver*, or *LEH ver*, is one of the six simple machines for performing work. It consists of a rod or plank that is free at both ends, like the plank of a seesaw, and some steady object on which the plank can rest, like the center post of a seesaw. The braced, or fixed, part is called the *fulcrum*. The distance from the load to the fulcrum is the *load arm*. The distance between the fulcrum and the lifting force is the *effort arm*.

A lever helps to lift weights with less effort. Children on opposite ends of a seesaw lift each other's weight up and down easily. Anyone who has ever pried something loose with a crowbar or a board has used a lever.

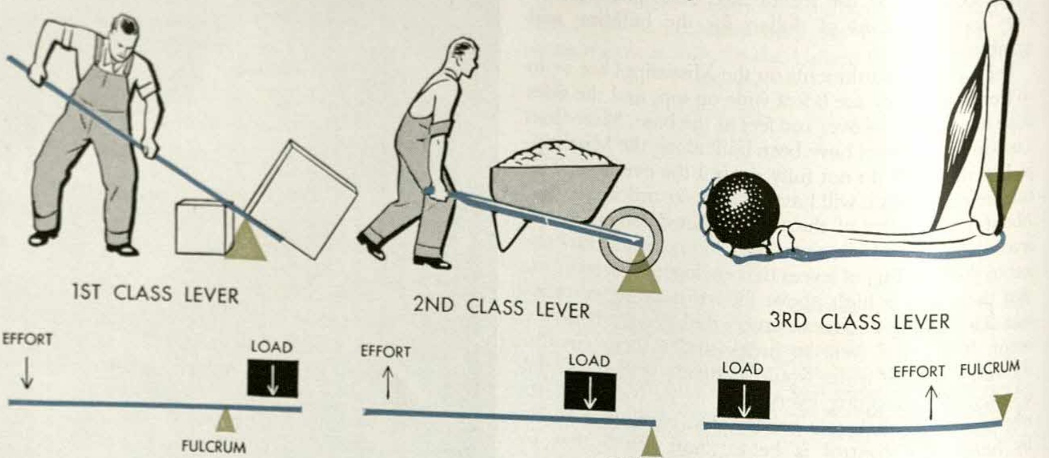
Classes of Levers

First-Class Levers have the fulcrum placed between the load and the effort, as in the seesaw, crowbar, and balance scale. If the two arms of the lever are of equal length, the effort must be equal to the load. To lift 10 pounds, an effort of 10 pounds must be used. If the effort arm is longer than the load arm, as in the crowbar, the effort travels farther than the load and is less than the load. An ordinary pair of scissors is a *double lever* of the first class.

Second-Class Levers have the load between the effort and the fulcrum. A wheelbarrow is a second-class lever (see WHEELBARROW). The wheel is the fulcrum, the handles take the effort, and the load is placed between them. The effort always travels a greater distance and is less than the load. A nutcracker is a double lever of this class.

Third-Class Levers have the effort placed between the load and the fulcrum. The effort always travels a shorter distance and must be greater than the load. The

THE THREE CLASSES OF LEVERS



In the 1st Class Lever, the fulcrum is between the effort and the load.

In the 2nd Class Lever, the load is between the fulcrum and the effort.

In the 3rd Class Lever, the effort is between the fulcrum and the load.

forearm is a third-class lever. The hand holding the weight is lifted by the biceps muscle of the upper arm which is attached to the forearm near the elbow. The elbow joint is the fulcrum. Sugar tongs are double levers of the third class.

Compound Levers combine two or more levers, usually to decrease the effort. By applying the principle of the compound lever, one might be able to balance a ton of hay by the weight of his hand. Archimedes is supposed to have said he could lift the world if he had a lever long enough and a fulcrum on which to put it.

Law of Equilibrium

A lever is said to be in equilibrium when the effort and the load balance each other. The law of equilibrium is:

The effort multiplied by the length of the effort arm equals the load multiplied by the length of the load arm.

For example, suppose you have a first-class lever 3 feet long with the fulcrum 1 foot from the load end. An effort of 1 pound would balance a load of 2 pounds.

This law of equilibrium is true for all classes of levers. An effort multiplied by its lever arm is called the *moment of the effort*, or *torque* (see MOMENT). The law of levers may be stated simply by saying that the moments of all the efforts on one side of the fulcrum must equal the moments of all on the other side.

Let L be the load, E the effort, e the effort arm, and w the load arm. The law of equilibrium may be stated in the following mathematical formula: L is to e as E is to w, or $L \times w$ equals $E \times e$.

To use the formula, suppose the effort is 25 inches from the fulcrum and a load of 100 pounds is placed 10 inches on the other side of the fulcrum. What effort is required to balance the load?

$$\begin{aligned} E \times 25 \text{ inches} &= 10 \text{ inches} \times 100 \text{ pounds} \\ 25\,E &= 1{,}000 \\ E &= 40 \text{ pounds} \end{aligned}$$

The *mechanical advantage* of a lever is the ratio between the load and the effort, or the load arm and effort arm. In the lever described above, the M.A. is 100 divided by 40, or $2\frac{1}{2}$.

Another example of a first-class lever is that of a man lifting a 300-pound stone with a 6-foot crowbar. The stone is 1 foot from the fulcrum. The man then pushes down on the crowbar 5 feet from the fulcrum. So, $E \times 5 \text{ feet} = 300 \text{ pounds} \times 1 \text{ foot}$; or $E = 60$ pounds, the force needed to balance the stone. The mechanical advantage is 5 to 1, or 5. The mechanical advantage can be given by dividing the load by the effort, or 300 by 60, or 5. ROBERT F. PATON

See also ARCHIMEDES; MACHINE; TORQUE.

LEVER BROTHERS COMPANY. See LEVERHULME, VISCOUNT.

LEVERHULME, *LEE ver hyoom,* **VISCOUNT** (1851-1925), WILLIAM HESKETH LEVER, founded Lever Bros., one of the world's largest soap manufacturers. He helped develop mass-production methods, and worked for good relations between workers and employers. He favored and developed plans for short hours, good wages, and profit-sharing by employees. Port Sunlight, his model factory town, encouraged community and town planning. William Lever was born in Bolton, England. He received his title in 1922. LOUIS FILLER

LEVERRIER, URBAIN. See WEATHER (Early Days).

LEVIATHAN, *lee VYE uh thun,* was a large, oil-burning steamship, and one of the finest passenger ships of its day. Germany built it in 1914 and first named it the *Vaterland (Fatherland)*. The *Leviathan* was 907.5 feet long and had a displacement of 59,957 tons. The United States seized the ship during World War I. It was renamed, and used to transport American troops. After July 4, 1923, the United States government put the huge vessel in service as a luxury liner. In 1929, the United States Lines, a private shipping firm, purchased the *Leviathan*. But the line lost money on the vessel's trips, and it was broken up and sold for scrap in 1938.

The word *leviathan* is often used to describe anything unusually large. In the Old Testament, a leviathan is described as a huge sea monster. JOHN J. FLOHERTY

LEVI'S, *LEE vyze,* is the registered trade name for a type of tight-fitting trousers with a low waistline, manufactured by Levi Strauss and Company. The cloth is usually 10- to 13-ounce white-backed denim (see DENIM). Levi's have triple-stitched seams, bar-tack reinforcements on pockets and belt guards, and heavy-duty zippers, buttons, and rivets. Western style *blue jeans*, or saddle pants, are similar in cut and design. The word *Levi's* originated with Levi Strauss, who started making the trousers in the 1850's for gold miners in California. The term *levis* is now used for all similar types of trousers. HAZEL B. STRAHAN

LEVITE, *LEE vite,* was a member of the tribe of Levi in ancient Israel. According to the Bible, all Levites were descendants of Jacob's son Levi. Each family of Levites had special duties in caring for the Tabernacle (see TABERNACLE). Aaron's family became the priests of Israel. When Canaan was divided among the tribes, no section was given to the Levites. But they received 48 scattered towns and were supported by a tithe from the other tribes. W. W. SLOAN

LEVITICUS, *leh VIT ih kus,* is the third book of the Bible. It is the only one made up entirely of religious and ethical laws. Its name comes from the tribe of *Levi*, from which the priests were descended. The book includes priestly regulations, and laws concerning marriage, sacrifices, and religious festivals. Chapter 11 gives the basic dietary laws that traditional Jews still observe (see KOSHER). Chapter 16 describes the ritual of Yom Kippur, or the Day of Atonement (see YOM KIPPUR).

Chapters 19 to 25 are often called the *Holiness Code*. They contain fundamental principles of human conduct, such as the command "thou shalt love thy neighbor as thyself" (19: 18). The verse inscribed on the Liberty Bell in Philadelphia—"Proclaim liberty throughout all the land unto all the inhabitants thereof"—also comes from this section (25: 10). ROBERT GORDIS

See also PENTATEUCH.

LEVITT, WILLIAM JAIRD (1907-), brought mass-production methods to the housing industry and became the biggest builder of houses in the United States. Between 1946 and 1951, he changed 1,200 acres of farm land at Levittown, Long Island, N.Y., into a community of 17,450 homes with a population of over 35,000. At Levittown, Pa., he built a community for about 60,000 persons, with schools and other facilities. Levitt was born in Brooklyn, N.Y. WILLIAM T. ARNETT

LEVITTOWN, N.Y. (pop. 65,276; alt. 86 ft.), is a community on Long Island. It developed from a housing project begun in 1946 for veterans of World War II (see New York [color map]). The firm of Levitt & Sons, Inc., began the housing project in an area that consisted of potato fields. Levittown grew from a population of about 450 in 1946 to 60,000 by the late 1950's. The builders mass-produced the homes in the community, and they all look much alike. The variation in their appearance results from different-colored shingles or paint. The land in the area is flat and treeless. Careful planning of the area has resulted in many advantages. Levittown has no slums or dangerous traffic intersections. It has central shopping districts and modern schools and recreation areas. William E. Young

LEVULOSE. See Artichoke; Sugar (Sources).

LEWES, *LOO ihs,* Del. (pop. 3,025; alt. 20 ft.), is a seaport on Delaware Bay. Cape Henlopen and the Delaware Breakwater protect the town from storms on the Atlantic Ocean (see Delaware [color map]). Lewes serves as a leading commercial fishing port, and is also a summer resort. Many of the pilots who guide ships through the Delaware River live at Lewes. The Dutch first settled the site in 1631. John A. Munroe

LEWES, BATTLE OF. See Henry (III) of England.

LEWES RIVER is one of the sources of the Yukon River in the Yukon Territory of Canada. For location, see Yukon River (map). The Lewes rises in Lake Laberge and flows northward for 338 miles. The river joins the Pelly River near Fort Selkirk to form the Yukon. The Lewes drains more than 35,000 square miles, an area nearly the size of Indiana.

LEWIN, KURT (1890-1947), became a leading child and social psychologist. He studied the effect of authoritarian and democratic behavior on groups, and the forces which change social groups. Lewin was a professor at Stanford, Cornell, and Iowa universities, and directed the Research Center for group dynamics at the Massachusetts Institute of Technology. Lewin was born at Mogilno, Germany, and earned a doctorate at the University of Berlin. He came to the United States in 1932. Claude A. Eggertsen

LEWIS, ANDREW, an American Revolutionary patriot. See Virginia (Famous Virginians).

LEWIS, D. B. WYNDHAM (1894-), is a British essayist, humorist, and biographer. He joined the *London Daily Express* as a columnist, and later wrote weekly articles for the *Daily Mail*. His books include *On Straw and Other Conceits* (1927); *François Villon* (1928); *Emperor of the West, Charles V* (1932); *Ronsard* (1944); and *Four Favorites* (1948). Lewis was born in Wales. He studied law at Oxford before serving in the British infantry during World War I. Joseph E. Baker

LEWIS, ELIZABETH FOREMAN (1892-1958), is known for her realistic stories about the young people of modern China, with its conflict of old and new ideas. She won the Newbery medal for her first book, *Young Fu of the Upper Yangtze* (1932). Her other books include *Ho-Ming, Girl of New China* (1934); *China Quest* (1937); *When the Typhoon Blows* (1942); and *To Beat a Tiger* (1956). She has also written many short stories for children and several books for adults. See Literature for Children (picture, Young Fu).

Elizabeth Lewis was born in Baltimore, Md., and was educated there and in New York City. In 1917, she went to China to do work for the Methodist Church. She taught in Chungking, Nanking, and Shanghai. In 1921, she was married to John Abraham Lewis, principal of the Boys' Academy in Nanking. Evelyn Ray Sickels

LEWIS, FRANCIS (1713-1802), a New York signer of the Declaration of Independence, spent most of his fortune in support of the patriot cause during the American Revolutionary War. From 1775 to 1779 he served as a delegate to the Continental Congress. He distinguished himself by his committee work, especially on the problem of army supply. He was also a strong supporter of George Washington. Lewis was born in Llandaff, Wales. He came to America in 1738, and became a wealthy merchant. Clarence L. Ver Steeg

LEWIS, GILBERT NEWTON (1875-1946), an American chemist, helped develop the modern electron theory of valence, a theory that explains the forces which hold atoms together in molecules. In 1916, he proposed that a pair of electrons, held jointly by two atoms, constitutes a chemical bond. He further suggested that a shell of eight electrons arranged in pairs about the atom resulted in increased stability for the atom. These ideas were taken up and expanded into an electron theory by such chemists as Irving Langmuir and Linus Pauling.

Lewis was born at Weymouth, Mass., and received his doctor's degree from Harvard in 1899. In 1912, he became professor of chemistry and dean at the University of California. Here he introduced thermodynamics into the chemistry curriculum. Herbert S. Rhinesmith

LEWIS, ISAAC NEWTON (1858-1931), invented the Lewis depression position-finder for artillery fire control (1891) and the Lewis machine gun (1911). In World War I, the Allied armies used more than 100,000 Lewis guns. By the beginning of World War II, however, the gun had become out of date. Lewis also invented an electric car-lighting system (1893) and a gas-filled torpedo (1909).

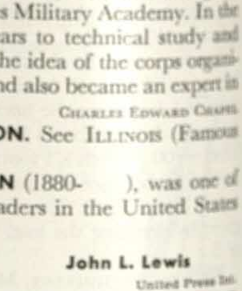
Lewis was born in New Salem, Pa., and was graduated from the United States Military Academy. In the army, he devoted many years to technical study and experiment. He originated the idea of the corps organization of artillery in 1902, and also became an expert in coast artillery construction. Charles Edward Chapel

LEWIS, JAMES HAMILTON. See Illinois (Famous Illinoisans).

LEWIS, JOHN LLEWELLYN (1880-), was one of the most powerful labor leaders in the United States from 1920 until he retired in January, 1960. He became president of the United Mine Workers union, then affiliated with the American Federation of Labor, in 1920. He held that post until his retirement. He had previously served as a UMW vice-president, and had also held several other union posts. Lewis led the UMW in organizing most of the coal industry.

John L. Lewis

United Press Int.



John L. Lewis favored

union organization by industries rather than by trades. In 1936, he broke away from the AFL to join with others in forming the Committee for Industrial Organization (later the Congress of Industrial Organizations). In 1946, he took the UMW back into the AFL, but made it an independent union in 1947. The UMW is noted for its medical-care program.

Lewis was born in Lucas, Iowa, on Feb. 12, 1880. He became a coal miner at the age of 12. Jack Barbash

LEWIS, MERIWETHER (1774-1809), commanded the expedition that first explored the Missouri and Columbia rivers and the area between them. He also served as governor of the Louisiana Territory.

In 1801, Lewis became private secretary to President Thomas Jefferson. Both of them were interested in exploring a land route to the Pacific Ocean. The completion of the Louisiana Purchase in 1803 made the expedition even more urgent (see LOUISIANA PURCHASE).

Brown Bros.
Meriwether Lewis

In 1804, an expedition led by Lewis and William Clark started from St. Louis. By late fall, the explorers had reached the Mandan Indian villages, where they spent the winter. The following spring, Sacagawea, an Indian woman, helped guide the expedition up the Missouri River and across the Rocky Mountains. When the explorers reached the Columbia River, they traveled down to the Pacific Ocean in canoes. On the return trip, Lewis followed the Marie River and Clark went down the Yellowstone River. The expedition reached St. Louis in September, 1806, and found that it had been given up for lost.

In 1807, Lewis became governor of the Louisiana Territory. In 1809, he started for Washington, D.C., from St. Louis. He stopped for a night in a lonely inn in central Tennessee. Lewis was found dead the next morning, possibly a suicide but more probably murdered.

Lewis was born on Aug. 18, 1774, in Albemarle County, Virginia. When he was 20, he helped put down the Whisky Rebellion. William P. Brandon

See also CLARK, WILLIAM; LEWIS AND CLARK EXPEDITION; MERIWETHER LEWIS NATIONAL MONUMENT; SACAGAWEA; WHISKY REBELLION.

LEWIS, SINCLAIR (1885-1951), an American novelist, became the first American writer to win a Nobel prize for literature. He received this award in 1930. Lewis had been awarded a Pulitzer prize in 1926, but refused to accept it. He said he did not believe in prizes, and felt other writers were more worthy.

His Writings. His most famous novels are *Main Street* (1920) and *Babbitt* (1922). Almost as successful were *Arrowsmith* (1925) and *Elmer Gantry* (1927). Each of Lewis' four main novels is a study of some aspect of American society. *Main Street* is a story of small-town life in the Middle West. *Babbitt* tells of a businessman's life. *Arrowsmith* is a portrait of a doctor and medical foundations. *Elmer Gantry* describes an evangelical clergyman. Each novel is, on the surface, a satirical attack on these phases of American society. But Lewis seemed to be talking about his own kind of people and wishing they were better. When Babbitt, at the end of his story, explains to his son Ted that Ted must do what he wants, as Babbitt never did, the reader feels sorry for Babbitt. Will Kennicott, in *Main Street*, is a finer and more tolerant person than his wife Carol, who appears to be a reforming heroine. Lewis had a brilliant gift for observing the characteristic details of American life. But he was not so successful when he tried to present a character in depth.

Lewis wrote three insignificant novels before he became famous with *Main Street*. While he was writing his most important works, he continued writing insignificant ones. After the 1920's, Lewis wrote little of importance except *It Can't Happen Here* (1935).

Eric Schaal, Pix
Sinclair Lewis

His Life. Lewis was born on Feb. 7, 1885, in Sauk Centre, Minn. He grew up in Sauk Centre, and many persons believe it was the model for "Gopher Prairie" in *Main Street*. Lewis was graduated from Yale University in 1908. For several years, he lived a restless and uncertain life. He failed as a free-lance writer in New York City, a construction worker on the Panama Canal, a newspaperman in Waterloo, Iowa, and a reporter for the Associated Press.

Toward the end of these years of wandering, Lewis began to sell some of the writing he had done during college. By 1916 he had sold several stories to *The Saturday Evening Post*, and had published two light novels, *Our Mr. Wrenn* (1914) and *The Trail of the Hawk* (1915). He then became a full-time writer. Most of his last years were spent wandering throughout Europe. He died in Rome, a lonely and embittered man. Arthur Mizener

LEWIS AND CLARK CAVERN, in southwestern Montana, is a huge underground chamber with many stalactites. It was made a national monument in 1908 and named for Meriwether Lewis and William Clark, the explorers of the Northwest. In 1938, the area was turned over to Montana. It is now Lewis and Clark Cavern State Park. See also STALACTITE. [illegible] D. [illegible]

LEWIS AND CLARK CENTENNIAL EXPOSITION was held in Portland, Ore., in 1905 to commemorate the 100th anniversary of the Lewis and Clark expedition. The exposition stressed industrial life in the Northwest and Alaska. It featured exhibits of gold mining, salmon fisheries, and lumbering.

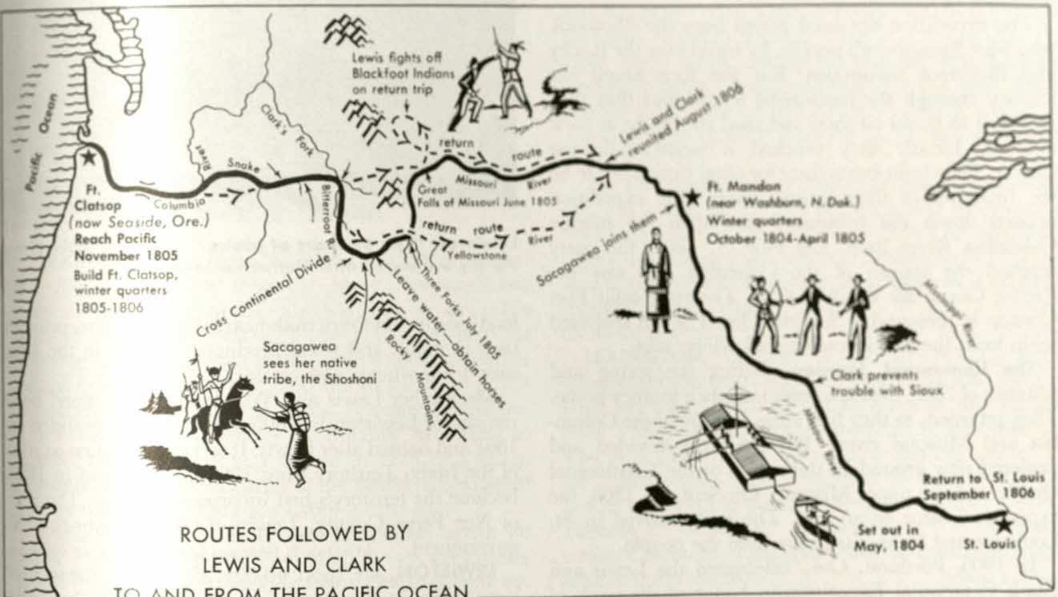
LEWIS AND CLARK COLLEGE is a coeducational school at Portland, Ore. The college is privately controlled, but it is connected with the Presbyterian Church. Lewis and Clark College requires its students to take a basic program in liberal arts and sciences. Additional undergraduate courses prepare students for many major professions, including business, music, youth leadership, and teaching. Lewis and Clark College was founded in 1867. For enrollment, see UNIVERSITIES AND COLLEGES (table). Morgan S. Odell

Oregon State Highway Commission; Dorothy Larmier, *Independent Record*

Meriwether Lewis and William Clark reached the Pacific Ocean through the beautiful Columbia River Valley. Here Sacagawea, the only woman with their expedition, points the way onward. The explorers started from St. Louis, Mo., in May, 1804, and finally sighted the Pacific on November 7, 1805. The bronze statue, at Helena, Mont., honors the two explorers and the Indian woman who served as their guide.

LEWIS AND CLARK EXPEDITION blazed a new trail to the Pacific Ocean. It strengthened the claims of the United States to the Oregon country, and stimulated a new, extensive fur-trading era in the West. The journals of the expedition provided valuable scientific information about Indian tribes and the natural wealth of the western lands.

Jefferson's Plans. In an address to Congress on Jan. 18, 1803, President Thomas Jefferson mentioned the need for knowing more about the lands west of the Mississippi River. He referred to the "river Missouri and the Indians inhabiting it," the abundance of furs going into the trade of Canada, and the desirability of establishing commerce "even to the Western (Pacific) Ocean." This vast region beyond the Mississippi did not then belong to the United States. But Jefferson asked Congress for the small sum of $2,500 to explore it. Congress approved the request. Jefferson told the lawmakers that suspicions concerning such a venture could be allayed by saying officially that the appropriation was simply to be "for the purpose of extending the external commerce of the United States."



ROUTES FOLLOWED BY
LEWIS AND CLARK
TO AND FROM THE PACIFIC OCEAN

Jefferson had already taken steps to purchase New Orleans and some surrounding lands from France. But he did not know then that on the following April 30, his ministers in France were to sign a treaty with Napoleon Bonaparte. This treaty would provide for the purchase of the entire Louisiana Territory, a vast area that stretched from the Mississippi River to the Continental Divide (see LOUISIANA PURCHASE).

Preparations. To lead the exploratory expedition, Jefferson chose Captain Meriwether Lewis, his private secretary. To help Lewis, he selected William Clark, younger brother of George Rogers Clark, and a close friend of Lewis. Clark had the rank of second lieutenant in the army. But both leaders were to be called *captain* by members of the expedition. They agreed privately to lead the expedition jointly. Lewis and Clark were experienced soldiers, and intimately familiar with Indians and the general conditions of frontier life.

Jefferson's most important instruction to Lewis and Clark concerned a survey for a practical land-water route to the Pacific. He instructed the expedition to ascend the Missouri River, cross the Continental Divide, and descend the Columbia River to its mouth. He hoped to establish peaceful relations with Indian tribes along such a route, and to prepare the way for trade and commerce with the Indians. Jefferson also ordered the expedition to gather and record information on geography and mineral resources, Indian tribal organizations and languages, and animal and plant life.

During the blustery, cold winter of 1803-1804, the expedition made final preparations for its important journey. It selected a spot on the Illinois side of the Mississippi near St. Louis for encampment. There Lewis and Clark recruited 28 rugged frontiersmen into the regular army, 4 as sergeants and the rest as privates. The party underwent rigorous training in military discipline and methods of how to best carry out individual assignments. Other persons joined the party to boost the total to 45. These included York, Clark's Negro slave, and several private frontiersmen.

Lewis and Clark had other tasks besides training and recruiting during this period of preparation. They had to obtain equipment, food supplies, and goods to be used as gifts for the Indians. They acquired three large river craft for transporting the men and supplies. One was a formidable 55-foot keelboat. The other two craft were light boats called *pirogues*. Each boat had oars, but it could be towed from shore by men or horses. Stowed aboard the three craft were six tons of supplies and ammunition.

Up the Muddy Missouri. The Lewis and Clark expedition set out on May 14, 1804, with the firing of a shot to mark the occasion. Both captains and other members of the party kept journals. These records tell the story of an 8,000-mile round trip to the Pacific Ocean. The expedition found the trip up the Missouri River arduous. After five months, the men reached the Mandan Indian country in what is now central North Dakota. There they built a fortlike log encampment amidst howling winds and falling snow. When spring came, the party added to the group a French Canadian trapper named Toussaint Charbonneau and his Indian wife, Sacagawea. Both proved especially useful as guides and interpreters during the westward march to the Shoshoni Indian country.

The expedition obtained horses from the Shoshoni, who were Sacagawea's people, for travel over the Rocky and Bitterroot mountains. But the men found the journey through the mountains so tortuous that they preferred to travel on foot, and used the horses as pack animals. Finally they reached a westward-flowing stream. They built boats there for what turned out to be the final lap of their journey west. The expedition headed down the tributaries and then the mighty Columbia River itself. On Nov. 7, 1805, the party reached the mouth of the Columbia and saw the Pacific Ocean for the first time. The men built Fort Clatsop at present-day Seaside, Ore. The fort sheltered them from the almost continuous winter rains.

The Homeward Journey. During the spring and summer of 1806, the explorers made their journey home. They returned, as they had gone, by way of the Columbia and Missouri rivers. But the party divided and explored new ground in the region of the Continental Divide and the upper Missouri. On Sept. 23, 1806, the expedition came to an end. The party arrived in St. Louis greeted by shouts of joy from the people.

In 1905, Portland, Ore., celebrated the Lewis and Clark Centennial Exposition in honor of the work of the explorers. O. O. WINTHER

Related Articles in WORLD BOOK include:

Clark, William
Jefferson, Thomas
Lewis, Meriwether
Montana (Interesting Places to Visit)
Sacagawea
Washington (color map, Historic Washington)

LEWIS WITH HARRIS is the largest of the Outer Hebrides Islands. See GREAT BRITAIN (color map).

LEWISBURG PRISON is a United States penitentiary near Lewisburg, Pa. The Bureau of Prisons of the Department of Justice operates this medium-security prison. The main prison buildings lie on a 26-acre tract surrounded by a wall. Farm buildings and an honor camp for minimum-custody prisoners are located outside the wall. The entire reservation covers 1,000 acres. The prison houses about 1,500 inmates, and has a staff of about 350 persons. It was opened in 1932. The inmates make clothing and sheet metal. C. R. HAGEN

LEWISTON, Ida. (pop. 12,691; alt. 739 ft.), lies on the western border of Idaho. It is often called the *Seaport of Idaho*. River boats travel 480 miles to the city from the Pacific Ocean by way of the Columbia and Snake rivers. For location, see IDAHO (color map).

The city is a trading center for a large mining, lumbering, and agricultural region. Industries include the world's largest white-pine sawmill, plywood and veneer plants, a pulp and paper mill, and two frozen-food plants. Factories make cartridges for guns, primers used in paint, and wood products. Farmers in the area raise fruit, wheat, and cattle.

Ross Hall

Lewiston, "The Seaport of Idaho," lies on the Snake River. The city was named after Meriwether Lewis.

Meriwether Lewis and William Clark camped near the site of Lewiston in 1805. The city was founded in 1861 and named after Lewis. It served as the first capital of the Idaho Territory from 1863 to 1864, and in 1863 became the territory's first incorporated town. The seat of Nez Perce County, Lewiston has a mayor-council government. WILLIAM S. GREEVER and JANET GROFF GREEVER

LEWISTON, Me. (pop. 40,804; alt. 200 ft.), the second largest city in the state, lies on the east bank of the Androscoggin River, across from Auburn. Together, they are known as the Twin Cities, and form the industrial heart of Maine. For location, see MAINE (color map).

First settled in 1770, and incorporated as a town in 1795, Lewiston became a city in 1861. Since the early 1800's, textiles, especially cottons, have been the backbone of the community. Sheets, pillowcases, fabrics, and bedspreads rank as the chief products. The city also makes electronic equipment and shoes. Thousands of French Canadians have moved to Lewiston since the Civil War to work in its mills. Today, they dominate the political and social life of the city. Bates College is in Lewiston. The city has a mayor-council form of government. ROBERT M. YORK

LEXICOGRAPHER, *LEHK sih COG rah fur*, compiles a *lexicon*, or dictionary. Samuel Johnson defined a lexicographer in part as "a harmless drudge that busies himself in tracing the original and detailing the significance of words." Johnson, who published his first great English dictionary in 1755, probably remembered the labor of writing the dictionary single-handedly. Today, a lexicographer usually works with a staff of language scholars. They scientifically study and record facts about the pronunciation, history, meaning, grammar, and usage of each word of a language. See DICTIONARY; JOHNSON, SAMUEL. ROBERT M. GORRELL

LEXINGTON, Ky. (pop. 62,810; alt. 955 ft.), is noted for fine horses and tobacco. More Thoroughbred horses are raised around Lexington than in any other part of the United States. These horses are bred for running races. Lexington is the leading tobacco market of the burley tobacco belt, and lies in the heart of the famous Kentucky Bluegrass region. It is one of the oldest cities west of the Allegheny Mountains. According to legend, the settlement was named in 1775 by a group of hunters who received news of the Battle of Lexington just as they were building a cabin on the site.

Lexington lies in east-central Kentucky, about 80 miles east of Louisville. For location, see KENTUCKY (color map). It is the second largest city in Kentucky. Products made in the city's factories and mills include furniture, tools, tobacco products, electrical supplies, packing-house supplies, clothing, flour and other grain products, leather products, and whisky. Lexington is the sheep and cattle market of Fayette County. Large numbers of Thoroughbred horses, trotting horses, and show horses are sold in the city. Several railroads serve Lexington. The city and Fayette County jointly maintain an airport. Lexington is one of the freight centers of Kentucky. The city is the home of Transylvania College, the oldest college west of the Allegheny Mountains. This college was founded in 1780. The University of Kentucky is also in Lexington.

Interesting places to visit in and around Lexington include Ashland, the home of Henry Clay; Hopemont, the home of Confederate General John Hunt Morgan; and the Mary Todd Lincoln Home, where the wife of President Abraham Lincoln lived as a young girl. The many horse farms among the hillsides that surround Lexington attract visitors throughout the year. Many persons enjoy viewing the tobacco markets, where the auctioneers shout their singsong chants to the competing bidders.

The first permanent settlement on the site of Lexington was made in 1779. The town was incorporated under the laws of Virginia in 1782. The Kentucky legislature held its first sessions in Lexington in 1792, the year that Kentucky separated from Virginia. Lexington received a city charter in 1832. It has a council-manager government.

THOMAS D. CLARK

LEXINGTON, Va. (pop. 7,537; alt. 945 ft.), is the home of Washington and Lee University and the Virginia Military Institute. The city lies in the Shenandoah Valley about 50 miles northeast of Roanoke (see VIRGINIA [map]). Lexington is a trading center for the valley region. The remains of General Robert E. Lee lie in a crypt in the Lee Memorial Chapel. General Thomas J. "Stonewall" Jackson's grave is in Presbyterian Cemetery. Lexington has a council-manager form of government.

FRANCIS B. SIMKINS

LEXINGTON, BATTLE OF. See REVOLUTIONARY WAR IN AMERICA (Lexington and Concord).

LEXINGTON, U.S.S. See AIRCRAFT CARRIER (History).

LEYDEN. See LEIDEN.

Lexington Chamber of Commerce

Lexington, Ky., is a leading market for Thoroughbred race horses. A statue honoring Man O'War, perhaps the most famous race horse, stands in Man O'War Memorial Park.

LEYDEN, *LIE den,* **JAR** was one of the earliest forms of condensers used to store an electric charge. It was first used in Leyden, The Netherlands, in 1746. The Leyden jar is a glass jar about the size of a canning jar, with a cork in the opening. About half the inside and outside of the jar is coated with tinfoil. The tinfoil coverings are conductors of electricity. The glass between them is the nonconducting insulator, or *dielectric.* A brass rod is inserted through the cork and brought in contact with the tinfoil inside the jar. A charge is sent down the rod from an electrical source. This charges the tinfoil by conduction. Current cannot pass through the glass, but the tinfoil outside becomes charged by induction when a person grounds it with his body. It has an opposite charge to the charge inside the jar. If the rod is now connected to the outer layer of tinfoil by a conductor, the two opposite charges will cause a spark. The spark given off by any condenser is not continuous. There are several inward and outward rushes. See also CONDENSER. PALMER H. CRAIG

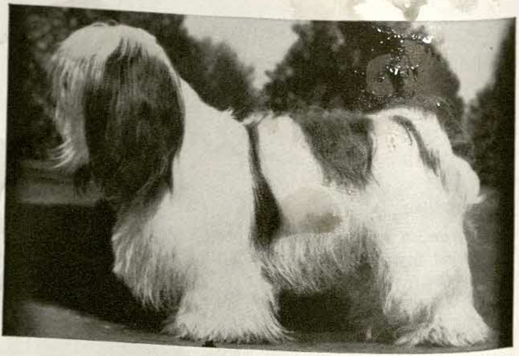
LEYTE. See PHILIPPINES (The Islands; Liberation); WORLD WAR II (Landing on Leyte).

LHASA, *LAH suh* (pop. 25,000), is the capital and holy city of Tibet. The Dalai Lama, a spiritual leader and exiled ruler of Tibet, lived there until the Chinese communists forced him to leave in 1959. Lhasa also is the home of another spiritual leader, the Panchen Lama, who now rules Tibet. Tibetans consider the city's temples sacred. Lhasa is sometimes called *The Forbidden City,* because Europeans are distrusted there. Until 1904, Europeans were banned from the city.

Lhasa lies high in the Himalayan Mountains of southeastern Tibet. Some of the surrounding peaks are among the highest in the world. Lhasa serves as a center of the caravan trade that moves to and from India, Burma, and China.

Lhasa is a closely packed city of stone and brick houses and shops. Many monasteries and temples stand among the other buildings. Most of the houses have low, flat roofs and no chimneys. Oiled paper, instead of glass, is used in the windows. At night, the city glows with light from torches and from crude lamps that burn vegetable oil.

THEODORE H. E. CHEN



Evelyn M. Shafer

The Lhasa Apso, a Terrier, Originally Came from Tibet.

LHASA APSO is a dog that came originally from Lhasa, the capital of Tibet. It was once classed as a terrier, but is now classed as a nonsporting dog. This

School Children in Lhasa sketch line drawings in front of the Potala Palace, once the winter residence of the Dalai Lama. The palace stands on a hill overlooking the city. It rises more than 400 feet in the air, and is 1,200 feet long. The Potala has become Lhasa's most famous landmark.

Eastfoto

dog has a long, heavy coat that looks like a mop. Its hair falls thickly over its face, covering its eyes and ears. It also has whiskers and a beard. The dog has a long, low body, and carries its tail curled tightly over its back. In Lhasa, it was used as a watchdog, even though it is only about 10 inches high. A large dog guarded the door outside, while the little Lhasa apso stayed inside to warn of danger. JOSEPHINE Z. RINE

LHOTSE I and **II.** See MOUNTAIN (table, Famous Mountains of the World).

LI HUNG-CHANG, *lee hoong jahng* (1823-1901), a Chinese statesman, served as First Grand Secretary of State for more than 20 years. He held great power from 1874 to 1894 and in the Boxer Rebellion of 1900. He handled foreign affairs, helped organize Chinese armies, and modernized the nation's transportation system. Li won national attention when he helped put down the Taiping Rebellion between 1850 and 1864 (see CHINA [Chinese Rebellions]). Li Hung-chang was born in Anhwei province. GEORGE E. TAYLOR

LI PO, *lee bow,* also known as LI T'AI-PO, *lee tie bow* (701-762), a Chinese poet, became famous for his lyrics. As a poet, he was unconventional, and championed the use of simple language. His poetry was graceful and delicate, or passionate and poignant, as the occasion required. With five other poets, Li Po formed the "Six Idlers of the Bamboo Grove" to write poetry. He also belonged to a group known as the "Eight Immortals of the Wine Cup." His poetic talent endeared him to Emperor Hsüantsung, although he later fell into imperial disfavor. Li Po was born in Szechwan province, China. SHAU WING CHAN

LI T'AI-PO. See LI PO.

LIABILITY INSURANCE. See INSURANCE (Public Liability).

LIAOTUNG PENINSULA and **GULF.** See RUSSO-JAPANESE WAR (Underlying Causes); YELLOW SEA.

LIARD RIVER. See YUKON (Location).

LIBBY, WILLARD FRANK (1908-), an American chemist, received the Nobel prize in chemistry in 1960. He earned the award for discovering carbon 14, or radiocarbon, in 1947, and finding a way to use it to determine the age of prehistoric plant and animal remains (see RADIOCARBON; ARCHAEOLOGY [Absolute Chronology]).

Libby was born in Grand Valley, Colo. He was graduated from the University of California, and taught there from 1933 to 1945. He then taught at the Institute for Nuclear Studies at the University of Chicago. In 1950, he became a consultant to the Atomic Energy Commission. After serving as a member of the commission from 1954 to 1959, he rejoined the faculty of the University of California. HERBERT S. RHINESMITH

LIBEL is a false printed or written statement that will harm a person's reputation or hold him up to contempt or ridicule. Spoken words that have this same effect are called *slander* rather than libel. *Defamation* includes both libel and slander. The reason for distinguishing between libel and slander is that written words form a permanent record and may do greater harm to the person libeled. For this reason, the libel exposes the libeler to a judgment for money damages, without his victim having to prove that he suffered any specific loss to himself measured in terms of dollars and cents. But slander, or defamation by word of mouth, usually imposes on the slanderer a money judgment only if his victim can prove actual financial loss because of the slander. An exception is in the case of certain grave slanders, such as spreading a false report that a person has committed a crime. See SLANDER.

The offense of libel does not lie in writing the words, but in showing them. No person can be successfully charged with libel for merely writing a defamatory letter to another. But if, before mailing the letter, the writer shows it to someone else, he has *published* the libel, and may be successfully sued for the offense. Showing a libelous picture is considered the same as publishing a libelous statement.

The victim of a libel may bring a civil suit for damages against the person who published it. If a libel can be shown to be malicious, it may also be considered a criminal offense, and is punishable by imprisonment. Truth of the libelous statement may be a defense against a civil libel suit for damages. But to defend at a trial for criminal libel, the accused must show not only truth but also prove that publication of the statement was for good motives and justifiable ends. Suits charging criminal libel occur less frequently than suits that fall under civil law.

Group libel is a recent concept, adopted by statute in a few states. Such statutes make it a criminal offense to libel a whole class of citizens, for example a group of some single race or creed. Such laws have been criticized on the ground that they interfere with freedom of the press. ARTHUR E. SUTHERLAND

LIBERAL ARTS are the learned habits of thought and speech considered essential for a free man. In the liberal-arts tradition, the free man makes important decisions without being a slave to habits, emotions, prejudices, or a language so limited that he can neither think clearly nor express himself well.

Historically, the liberal arts included two groups of studies. One involved the correct use of language (grammar), thinking clearly (logic), and expressing one's ideas persuasively (rhetoric). The second group, concerned with size, shape, and number relationships among things, included the various branches of mathematics. Originally, these were arithmetic, geometry, astronomy, and harmony. Schools of liberal arts usually combined these disciplines with the study of good literature, the physical sciences, the biological sciences, and ethical problems.

Out of these traditional studies have grown the contemporary groupings into natural sciences, social sciences, and humanities. The humanities include language, literature, fine arts, history, and philosophy (see HUMANITIES, THE). American colleges that concentrate on these studies are usually called liberal-arts colleges.

M. L. BORROWMAN

LIBERAL PARTY is a political organization that supports the parliamentary system of government, civil liberties, and progressive legislation in all aspects of national life. The Liberal party of Britain was the mother of Liberal parties throughout the world.

Early History. After the Reform Bill of 1832, the historic Tory and Whig parties in Britain began to fall apart. By the 1850's, two new parties had emerged: the Conservatives, led by Benjamin Disraeli, and the Liberals, led by William E. Gladstone. Both in its policies and in its philosophy, the Liberal party was influenced by the Whig regard for national traditions in making changes, and by the ideas of Jeremy Bentham.

The Period of Middle-Class Liberalism. From 1832 until the Reform Bill of 1867 was passed, the Liberals held power most of the time. This was the period of middle-class liberalism, when only the propertied classes could vote, and business interests influenced national policies. The Liberals opposed state intervention in the interest of the working class. But they put through many notable reforms. These included the abolition of slavery in the Empire (1833); the Poor Law (1834); the Municipal Reform Act (1835); and, most notable of all, the repeal of the Corn Laws (1846).

The Liberals did not like imperialism, and favored policies that tended to loosen the ties of colonies to the mother country. In 1848, a Liberal ministry established self-government in Canada, an action that later led to the inauguration of the "Dominion" system.

The Liberal Party and the Workers. After the Reform Bill of 1867 gave the vote to the workers, the Liberal party underwent a great change. It ceased to be the champion of middle-class liberalism, and became the advocate of democratic reforms in the interest of the lower classes. The Liberal party put through the Reform Bill of 1884, giving the vote to farm laborers. In 1870, it set up publicly-supported elementary schools and freed trade unions from many restrictions. In 1881, it put through land reform for Ireland.

A Great Liberal Ministry took office in 1906. Its most notable members were Herbert H. Asquith, Prime Minister from 1908 to 1916; David Lloyd George, Prime Minister from 1916 to 1922; and John Morley. These men put through social reforms in the interest of the working class. Notable reforms included the Workmen's Compensation Act; the Trades Disputes Act, which prohibited suits against trade unions engaged in trade disputes; sickness and unemployment insurance; and a minimum wage act. The Parliament Act of 1911 reduced the power of the House of Lords to stop parliamentary action.

Decline of the Party. The great Liberal victory of 1906 saw the appearance of a rival political party, the British Labour party. It was destined to displace the Liberal party as one of the two great parties in Britain. The swing to the left, and socialism, became as marked in Britain as on the European continent. The Liberals could not meet the challenge of the Labourites because they did not favor socialism, either through the "inevitability of gradualness" as advocated by the Labourites, or through the "dictatorship of the proletariat," as advocated by the communists. The elections of 1922 made the Liberals a small third party. The Labour party had become the officially recognized "Opposition" to the Conservative majority. Since then, the Liberals have almost disappeared from the political scene. The more conservative element joined the Conservative party, and the more radical element went to the Labourites.

In dying as a party, the Liberals left a great legacy to both the Conservatives and the Labourites. The Conservatives ceased to be "stern, unbending Tories" and became far more liberal both in ideas and policy. The Labour party took over the fundamental Liberal party principle of making progress a step at a time through parliamentary methods.

J. SALWYN SCHAPIRO

Related Articles in WORLD BOOK include:

Asquith, Herbert H.
Campbell-Bannerman, Sir Henry
Canada, Government of (Political Parties)
Conservative Party
Disraeli, Benjamin
Gladstone, William E.
Labour Party
Lloyd George, David

LIBERAL REPUBLICAN PARTY was a United States political party formed in 1872 to protest the re-election of President Ulysses S. Grant. It was made up of former members of the Republican party.

The leaders of the party had become dissatisfied with Grant's administration and policies. Among other things, they suspected Grant's administration of corruption and disliked his policies on civil service and tariff reform. Liberals and reformers had started the party, but it soon attracted a mixed group of politicians and factional leaders. When the party held its convention in Cincinnati, the members found it difficult to agree on a candidate or a platform.

In the end, the party nominated newspaper editor Horace Greeley for the presidency on a platform of "universal amnesty and universal enfranchisement." This meant the immediate establishment of civil governments in each of the former Confederate states, and the removal of all restrictions on the political rights of their citizens. The Liberal Republican party was severely defeated in the election of 1872, and quickly disappeared from American life.

MAURICE P. HUNT

See also REPUBLICAN PARTY (The Progressive Split).

LIBERATOR, THE. See BOLÍVAR, SIMÓN.

Liberia's Only Railroad hauls iron ore from mines in the Bomi Hills to Monrovia, a distance of about 40 miles. Liberian iron ore is so rich—averaging 67 per cent pure iron—that it is in great demand for steelmaking. An American firm developed the deposit after World War II. The first shipment of the ore was made in June, 1951.

Republic Steel from Black Star

LIBERIA, *lie BEER ih uh,* is the second oldest Negro republic in the world. Only Haiti is older. The American Colonization Society founded Liberia in 1822 as a place to send free Negroes from the United States. The name *Liberia* comes from the Latin word *liber*, meaning *free*. Monrovia is the capital and largest city.

The Land and Its Resources

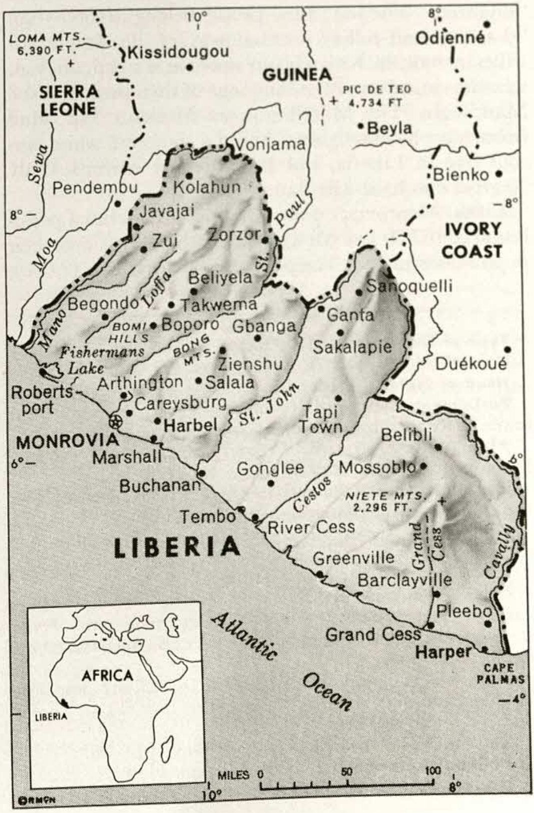
Location, Size, and Description. Liberia lies on the southern edge of Africa's great western bulge. Sierra Leone, Guinea, and the Ivory Coast border it. Its low coast line stretches 350 miles along the Atlantic Ocean. The *Map* shows that Liberia extends inland about 160 miles in places. Liberia covers 43,000 square miles.

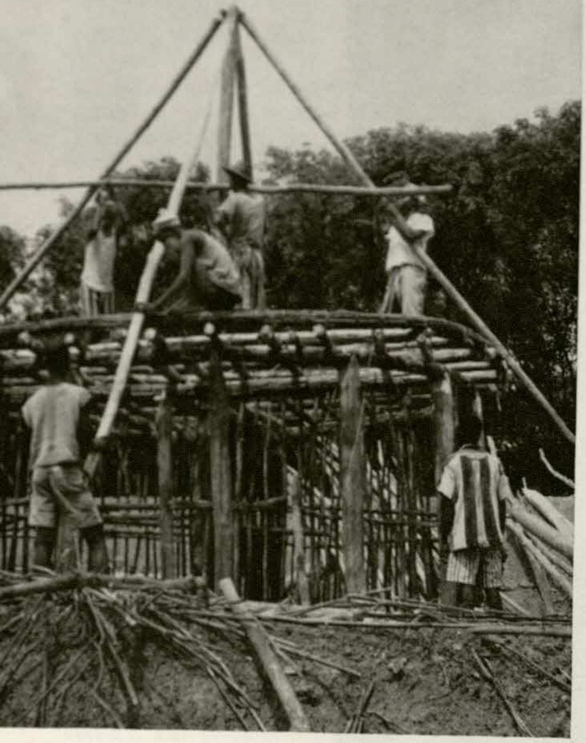
Natural Resources. The Bomi Hills in the northwest have some of the world's richest iron-ore deposits. Mining engineers have estimated these reserves at 80,000,000 tons of high-grade ore. Diamonds are found near the Sierra Leone border. Liberia also has deposits of gold, granite, lead, marble, mica, quartz, silver, and zinc. Heavy forests cover the southern and central sections. Much of Liberia has rich soil.

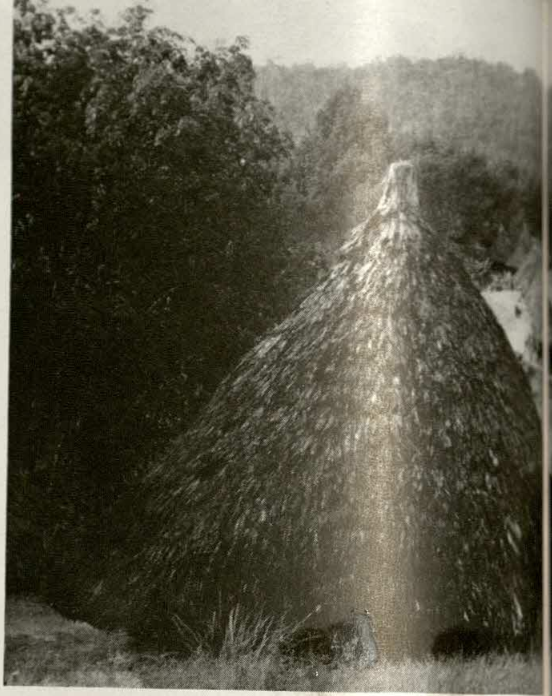
Climate. Liberia has one of the most humid climates in Africa. The rainy season lasts from May through October. The average annual rainfall measures about 180 inches along the coast, and 80 to 100 inches inland. The country's humidity ranges between 65 and 95 per cent. Liberia has an average annual temperature of between 70°F. and 80°F. The hottest period comes in January at the height of the dry season.

Life of the People

The People. About 1,500,000 persons live in Liberia. The ruling class consists of 15,000 to 20,000 Americo-Liberians, or colored persons descended from the first







Building Material for Liberian Homes comes from the nearby forests. The framework is tied together with jungle vines, *left.* Wet clay, applied to the framework and allowed to dry in

settlers. They speak English, and nearly all of them are Protestants. Another 50,000 to 75,000 have adopted the language and religion of the ruling class, and are called "civilized." The rest of the people belong to more than 20 tribes, and follow a tribal way of life. Important tribes include the Kru, who are noted as seamen; the Vai, who developed a written language of their own; and the Mandingos. The Mandingos are Moslems, but other tribes have local religions. About a thousand white persons live in Liberia, but they are not citizens. Only Negroes can hold Liberian citizenship.

Cities. Monrovia, on the Atlantic Ocean, has a population of 10,000 (see MONROVIA). Other towns and their populations include Harper (5,000), Buchanan (2,000), Robertsport (1,800), Marshall (1,770), Greenville (1,640), Grand Cess (1,220), Tapi Town (850), River Cess (810), and Careysburg (650).

FACTS IN BRIEF

Type of Government: Republic.

Capital: Monrovia.

Head of State: President.

Parliament: Senate of 10 members (6-year terms) and house of representatives of 31 members (4-year terms).

Area: 43,000 sq. mi. *Greatest distance* (north-south) 210 mi.; (east-west) 230 mi. *Coast line,* 350 mi.

Elevation: *Highest,* nearly 6,000 feet above sea level in the inland border ranges. *Lowest,* sea level.

Population: About 1,500,000. *Density,* 35 persons per sq. mi. *Distribution,* rural, over 90 per cent (estimate); urban, under 10 per cent (estimate).

Chief Products: *Agriculture,* bananas, cocoa, coffee, cassava, rice, rubber, sugar. *Mining,* iron ore. *Forest Products,* kola nuts, palm oil and kernels, piassava fiber, raffia-palm fiber.

Flag: Six red and five white horizontal stripes. The blue canton has a large white star. See FLAG (color picture, Flags of Africa).

National Holiday: Independence Day, July 26.

National Anthem: "All Hail, Liberia, Hail."

Money: *Basic unit,* United States Dollar.

Work of the People

Agriculture provides the chief means of livelihood for most Liberians. Farming methods generally are primitive except on the plantations.

Rubber is the country's chief crop. In 1926, the government granted a 99-year lease on 1,000,000 acres to the Firestone Tire & Rubber Company. Headquarters are at Harbel, about 30 miles east of Monrovia. The company has planted over 90,000 acres in rubber trees. Independent rubber plantations have planted more than 50,000 acres. Liberia's annual rubber production totals over 43,900 tons. Rubber ranks as the chief export of Liberia. Most of it goes to the United States.

Rice is a major crop. Other products include bananas, cocoa, coffee, cassava, and sugar.

Mining. The Liberia Mining Company has an 80-year contract from the Liberian government to mine iron ore in the Bomi Hills region. Liberia exports over 2,000,000 tons a year to the United States. Liberia also mines small quantities of diamonds and gold.

Forest Products include piassava fiber, fiber from the raffia palm, palm oil and kernels, and kola nuts.

Transportation. Roberts Field at Harbel serves as an international airport. James Spriggs Payne Airfield near Monrovia is a smaller airstrip. American Lend-Lease aid helped build Monrovia's harbor, which opened as a free port in 1948 (see FREE PORT). Liberia has one of the world's largest merchant fleets. But it consists almost entirely of vessels from other countries. Their owners register them in Liberia to escape the higher taxes many other nations levy on shipping. Liberia's first rail-

Authenticated News

the sun, forms the walls. The finished homes, *above*, have cone-shaped roofs made of palm-leaf thatch. This type of roof sheds rain, and also keeps out the burning rays of the tropical sun.

road, built in 1951, runs about 40 miles between Monrovia and the Bomi Hills. The country has about 1,200 miles of roads. Launches can travel up the St. Paul River for 25 miles, and the Cavally River for 80 miles.

Education

Only about 5 per cent of Liberia's people can read and write. About two thirds of the students attend private and missionary schools, and the remainder go to government schools. Liberian law requires all missionary societies engaged in evangelical work to support at least one school. Over 500 schools operate in the country. The University of Liberia, in Monrovia, was founded in 1851 as Liberia College.

Government

Liberia patterned its constitution after that of the United States. The president of Liberia is elected to an eight-year term. He may be re-elected any number of times, but succeeding terms run only four years. A cabinet helps him in his executive work. The people elect the 10 senators to six-year terms, and the 31 members of the house of representatives for four years. Legislative acts during the 1940's gave all citizens the right to vote, but few outside the coastal area ever do so. Most people belong to the True Whig party. A five-man supreme court heads the judicial department. The president appoints all judges for life.

The coastal region is divided into five counties and one territory. Three provinces cover the interior. The president appoints administrators for indefinite terms.

History

Early Days. Liberia grew out of the efforts of the American Colonization Society, organized in 1816. This society wanted to set up a colony in Africa for free Negroes from the United States. The society sent the first group in 1822. These people settled at the mouth of the Mesurado River (now the St. Paul River) and named their town Monrovia in honor of President James Monroe. The early settlers had to fight a number of wars with the local tribes.

Liberia was declared a republic by mutual agreement between the settlers and the society in 1847. Joseph J. Roberts, born in Virginia, served as the first president. He remained in office until 1856.

Land Disputes. Liberia laid claim to much of its interior on the basis of explorations by its citizens. But in the late 1800's, neighboring French and British colonists occupied some of the land. In order to protect what remained, Liberia instituted a system of governing the interior based on British colonial administration. The United States Army helped organize and train the soldiers of the Liberian Frontier Force.

External Relations of Liberia have been complicated by debt, which in the 1890's and early 1900's became a danger to the sovereignty of the country. In 1909, the United States set up a customs office which operated until the debt was paid off. Liberia's economic awakening came with the Firestone rubber lease of 1926.

Liberia entered World Wars I and II on the side of the Allies. American troops were stationed in Liberia during World War II to prevent Axis forces from using the coastal region as a base of operations. Liberia became a charter member of the United Nations in 1945.

Recent Events. William V. S. Tubman began his first term as president in January, 1944. Later that year, the United States government sent a Public Health Service mission and an economic advisory commission to Liberia. A development program was started in 1945 to build new roads, electric-power plants, public buildings, and low-cost housing. In 1956, the legislature approved codification of the nation's laws.

The National Unification Program sponsored by Tubman's administration stresses the common nationality of all Liberians, and points toward the elimination of all distinctions. One of the major accomplishments of Liberia in the mid-1900's has been its ability to attract foreign investments. Through low taxes and little governmental interference, Tubman has persuaded several countries to invest capital in Liberian industries. Tubman was re-elected to his fourth term in 1959 by a vote of about 355,000 to 40.

DANIEL F. MCCALL

See also MONROVIA; RUBBER (table); SHIP AND SHIPPING (table); TUBMAN, WILLIAM V. S.

LIBERTY is the exemption from unnecessary restraints. The word usually has the same meaning as *freedom*. The two main types of liberty are moral liberty, often called freedom of the will, and legal or political liberty.

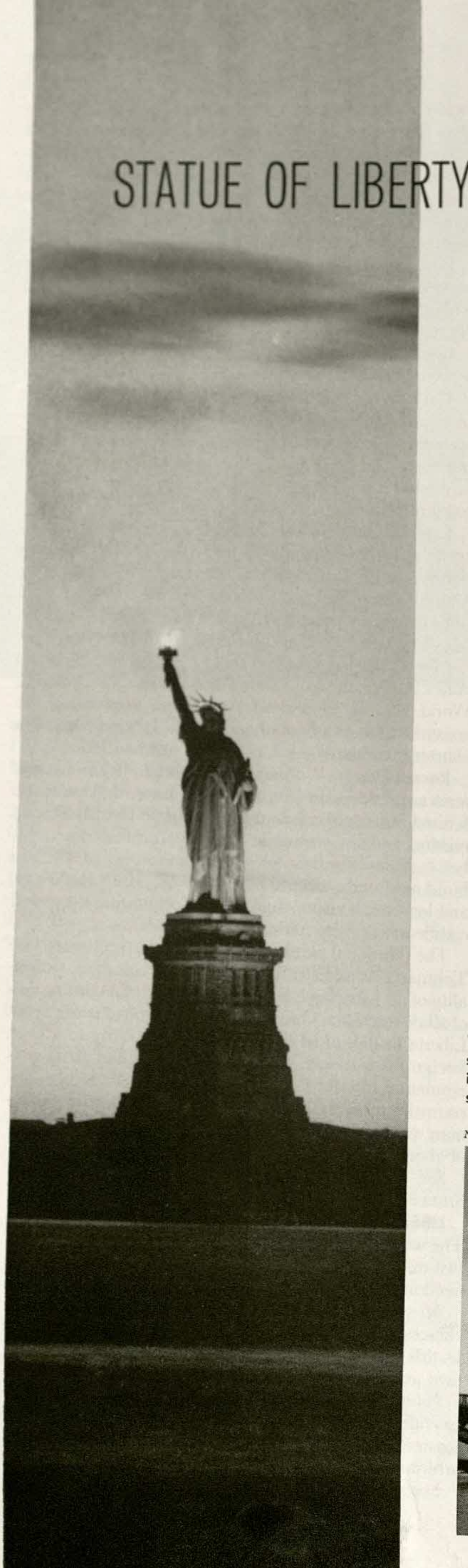
Moral liberty means the power of a person to make choices about right and wrong and about good and evil. In this way, he can form his own opinions and guide his own actions.

Political liberty is freedom guaranteed by laws. It provides the means for each person to become his own master. Political liberty protects the individual from the arbitrary activities of the government.

RUSSELL KIRK

See also FREEDOM with its list of Related Articles.

STATUE OF LIBERTY



LIBERTY, STATUE OF, is the large copper statue that stands on Liberty Island (formerly Bedloe's Island) in New York Harbor. Its proper name is *Liberty Enlightening the World.* This statue is the largest ever made. France gave the monument to the United States in 1884 as a symbol of friendship and of the liberty that citizens enjoy under a free form of government. The French people donated about $250,000 for the construction of the statue, and the people of the United States gave about $280,000 for the pedestal. A model of the statue stands on a bridge that crosses the Seine River in Paris.

Description. The statue represents a proud woman, dressed in a loose robe that falls in graceful folds to the top of the pedestal on which the statue stands. The right arm holds a great torch raised high in the air. The left arm grasps a tablet bearing the date of the Declaration of Independence. A crown with huge spikes, like sun rays, rests on the head. At the feet is a broken shackle, which people seldom notice, symbolizing the overthrow of tyranny.

This statue is one of the most celebrated examples of *repoussé* work, which is a process of hammering metal over a mold in order to shape it. The statue is made of more than 300 thin sheets of copper, with a total weight of about 100 tons. The outer layer of copper is supported by an iron framework, which resembles that of an oil derrick. The statue stands 151 feet high and weighs 450,000 pounds. The torch rises 305 feet above the base of the pedestal. It gleams at night with powerful incandescent and mercury-vapor lights as a symbol of liberty shedding light upon the world. Floodlights from the base shine upon the statue throughout the night.

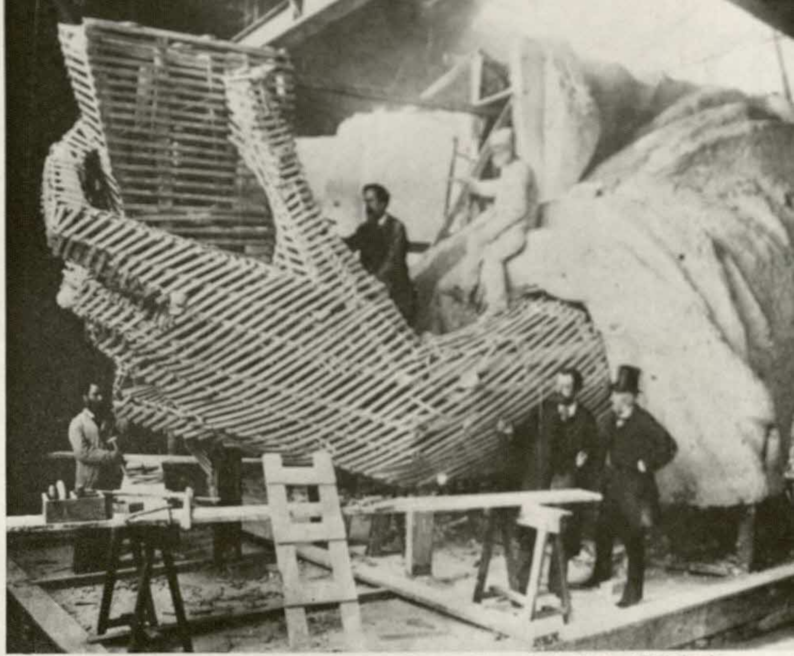
An elevator carries visitors up the pedestal to the foot of the statue. At this point, an observation balcony affords a magnificent view of the harbor and the city. Visitors may climb a steep, narrow, spiral staircase from the pedestal as high as the crown on the statue's head. A ladder inside the arm leads to the torch but this is too narrow and steep for public use.

History. The French historian Édouard de Laboulaye first suggested a monument to symbolize liberty. His friend Frédéric Auguste Bartholdi designed the statue and chose its site. Bartholdi also spent a great deal of

The Statue of Liberty, *left,* facing the channel of New York Harbor, stands as a symbol of American liberty and as a beacon of refuge for immigrants. It was given by France to the United States in 1884. A small model, *below,* stands above the Seine River in Paris.

New York Times, Leonard Stern; Bernadine Bailey

Frédéric Auguste Bartholdi, *above,* a noted French sculptor, designed the Statue of Liberty and supervised its construction. From an original model 49 inches high, he worked up to a full-scale model of lath and plaster, *right.* Later copper was hammered over wooden molds shaped to its contours. Because no Paris studio could hold the statue, it was set up in a street when France presented it to the United States.



New York Times Studio; National Park Service

time and energy raising funds in France and the United States to bring the plan to completion. Alexandre Gustave Eiffel, who designed the Eiffel Tower in Paris, built the supporting framework.

The people of France presented the Statue of Liberty to the Minister of the United States in Paris, on July 4, 1884. The statue was shipped to the United States in 214 cases aboard the French ship *Isère* in May, 1885. The site chosen for the statue was the center of old Fort Wood, on Bedloe's Island, overlooking the ship channel of New York Harbor. President Grover Cleveland dedicated the monument on October 28, 1886. It was unveiled before representatives of both countries.

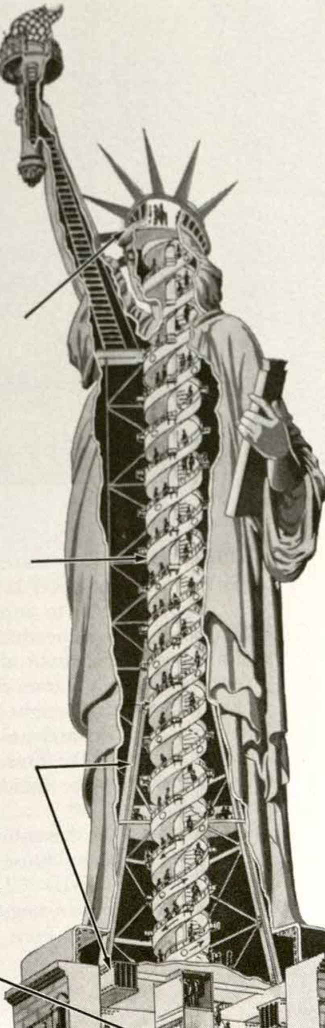
"The New Colossus," a poem by Emma Lazarus, was inscribed on a tablet in the pedestal in 1903. It reads:

Not like the brazen giant of Greek fame,
With conquering limbs astride from land to land;
Here at our sea-washed, sunset gates shall stand
A mighty woman with a torch, whose flame
Is the imprisoned lightning, and her name
Mother of Exiles. From her beacon-hand
Glows world-wide welcome; her mild eyes command
The air-bridged harbor that twin cities frame.
"Keep ancient lands, your storied pomp!" cries she
With silent lips. "Give me your tired, your poor,
Your huddled masses yearning to breathe free,
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door!"

The floodlights at the base were added in 1916. The statue became a national monument in 1924. It was repaired and strengthened throughout in 1937. Congress changed the island's name to Liberty Island in 1956. The National Park Service maintains the Statue of Liberty National Monument. Thomas M. Pitkin

See also Bartholdi, Frédéric A.; Eiffel, Alexandre G.; Lazarus, Emma; Liberty Island; United States (color picture).

CROSS SECTION OF THE STATUE OF LIBERTY



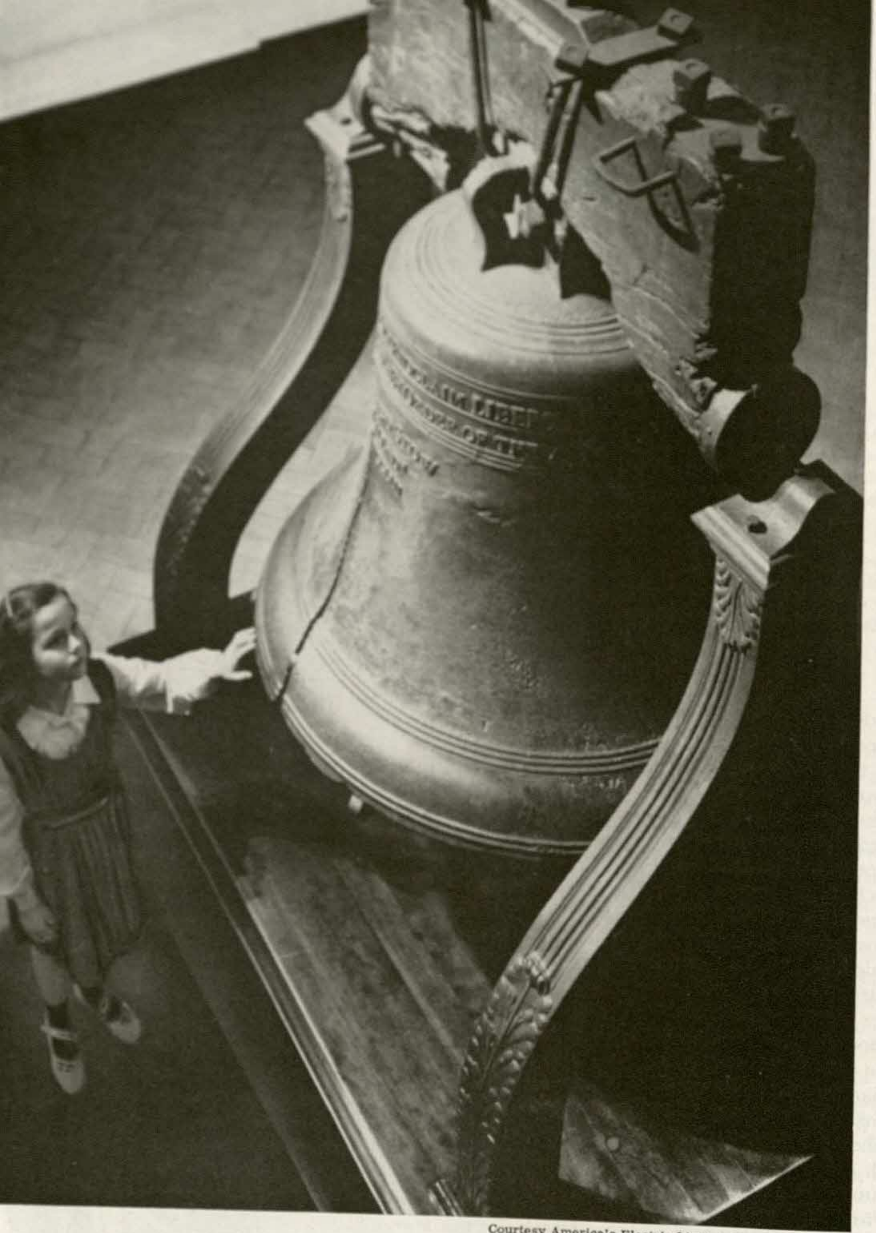
The Largest Statue ever made, Liberty measures 151 feet from her sandals to the top of her torch. The statue stands on a great granite and concrete pedestal on Liberty Island. The torch towers 305 feet above the base of the pedestal. The statue, made of thin sheets of hammered copper over a framework of iron, weighs 450,000 pounds.

Liberty's Torch shines through leaded glass, illuminated by 19 lamps with a total of 13,000 watts. An observation platform in the crown has 25 windows, and can accommodate 30 viewers.

Interior of the Statue has two parallel stairways that spiral up from the base to the crown. Each stairway has 168 steps, with rest seats at every third turn of the spiral.

Liberty's Framework is made of iron and is supported by steel columns. The framework was made by Gustave Eiffel, who later built Paris' Eiffel Tower.

Base of the Statue is reached by an elevator which brings visitors from the ground floor up through the pedestal, a distance of about 150 feet.



The Historic Liberty Bell was made in England in 1752 and later was recast in Philadelphia. It was rung each year until 1835, when it cracked during the funeral of Chief Justice John Marshall.

Courtesy America's Electric Light & Power Companies

LIBERTY BELL is a treasured relic of the early days of American independence. It was rung July 8, 1776, to call citizens together to announce the adoption of the Declaration of Independence. Its inscription, "Proclaim Liberty throughout all the land unto all the inhabitants thereof," is from the Bible (Leviticus 25:10).

The Liberty Bell weighs more than 2,080 pounds. The province of Pennsylvania paid about $300 for it in 1752. It is now in the Tower Room of Independence Hall in Philadelphia. Beside the bell a printed card gives its history:

"By Order of the Assembly of the Province of Pennsylvania for the State House in Philadelphia, Pass and Stow, Philadelphia, MDCCLIII. This bell was first cast in England. It broke in ringing after its arrival and was recast in Philadelphia from the same metal, with the same inscription, in 1753. In the adjoining yard it rang at each successive anniversary of the adoption of the Declaration until 1835. It broke July 8, that year, while tolling during the funeral solemnities of John Marshall, Chief Justice of the United States, who died in this city."

The Liberty Bell is no longer rung, but it has been struck on special occasions. On June 6, 1944, when Allied forces landed in France, Philadelphia officials struck the bell. Special sound equipment picked up the tone, amplified it, and broadcast it to all parts of the United States. Officials rang a larger bell, in the steeple of Independence Hall, to announce America's entry into World War I.

John R. Alden

LIBERTY BELL, in Mexico. See Mexico (Revolt Against Spain; color map, Historic Mexico).

The Liberty Cap has long been a symbol of freedom.

LIBERTY CAP is a famous symbol of freedom. In modern times it has appeared on certain American coins and on the seals of several Central and South American republics.

The modern liberty cap is copied from the cone-shaped Phrygian headdress which was given to a freed slave in ancient Rome. At the start of the French Revolution, the *bonnet rouge*, or red cap, was adopted by the "patriots," as the opponents of monarchy were called. ROBERT B. HOLTMAN

LIBERTY, EQUALITY, FRATERNITY is the English translation of the French motto *Liberté, Égalité, Fraternité*, first used by the leaders of the French Revolution.

LIBERTY HALL. See KENTUCKY (Interesting Places).

LIBERTY ISLAND is an oval-shaped island in New York Bay on which the Statue of Liberty stands. The island lies 1½ miles west of the Battery, the nearest point on the shore. It covers 12 acres.

Before Liberty Island was officially renamed in 1956, it was called *Bedloe's Island*. It belongs to the U.S. government. The Statue of Liberty, given by France in 1884, was received in 1885 and dedicated in 1886. The island's Fort Wood is the base on which the statue stands. The fort, built in the shape of an 11-point star, was completed in 1811 and named for an officer killed in the War of 1812. The area was a military post until 1937. Then the land was added to the Statue of Liberty National Monument. WILLIAM E. YOUNG

See also LIBERTY, STATUE OF.

LIBERTY LOAN was the name of four bond issues of World War I designed to help the United States government finance the cost of the war. A fifth issue was called a *Victory Loan*.

The Department of the Treasury issued bonds in amounts from $50 to $100,000. All five loans were oversubscribed. The first liberty loan was issued at 3½ per cent interest; the second at 4 per cent; the third and fourth at 4¼ per cent; and the fifth at 3¾ and 4¾ per cent. More than $21,000,000,000 worth of bonds was absorbed in the five loans issued.

See also NATIONAL DEBT; WORLD WAR I (The United States Enters the War).

LIBERTY PARTY was the first political party in the United States to give most of its attention to the slavery question. The politician James G. Birney (1792-1857) and the poet John Greenleaf Whittier were the leading supporters of the group. From July, 1844, to March, 1845, Whittier edited the *Middlesex Standard*, a paper published in Lowell, Mass., by the Liberty party. He was also chiefly responsible for editing the *Essex Transcript*, another of the party's publications.

The party nominated Birney for President in 1840, but he made a poor showing in the election. Renominated in 1844, Birney polled 62,000 votes.

In 1848, the party united with other groups to form the Free Soil party. MAURICE P. HUNT

See also ABOLITIONIST; FREE SOIL PARTY.

LIBERTY TREE. See BOSTON (Interesting Places to Visit).

LIBERTY TREE FLAGS. See FLAG (color picture, Flags in American History).

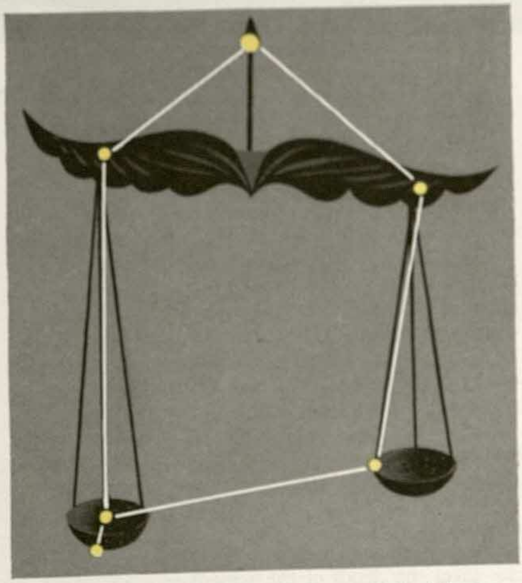
LIBIDO, *lih BY' doh*, is a psychoanalytic term referring primarily to instincts or urges that are satisfied pleasurably. Sigmund Freud was the first to use this term (see FREUD, SIGMUND).

Some psychoanalysts believe that the libido develops through certain stages. In the *oral* phase, the infant derives pleasure from such activities as sucking and biting. In the *anal* phase, the child obtains satisfaction and interest in bowel control. The *genital* phase includes early adolescence, with its problems of adjusting the sexual drives to fit the patterns of society.

Many psychiatrists believe that the libidinal development is a more continuous process, however, and that the phases are less distinct. GEORGE A. ULETT

See also PSYCHOANALYSIS with its list of Related Articles.

LIBRA, *LIE bruh*, is the seventh sign of the zodiac. The constellation Libra lies entirely south of the celestial equator, between Virgo and Scorpius. The symbol is a pair of weighing scales, and the name means *The Balance*. Libra is the only sign of the zodiac that does not represent a living thing. However, the Greeks originally pictured Libra as a separate constellation representing the claws of Scorpius, the scorpion.



The Constellation Libra Symbolizes a Pair of Scales.

The sun enters the zodiacal sign of Libra on September 23, on its way southward across the equator. However, because of the precession of the equinoxes, the sun is actually in the constellation Virgo at that time. The sun does not enter the constellation Libra until late in October. I. M. LEVITT

See EQUINOX (Precession of the Equinoxes); SCORPIUS; VIRGO; ZODIAC.

LIBRARY

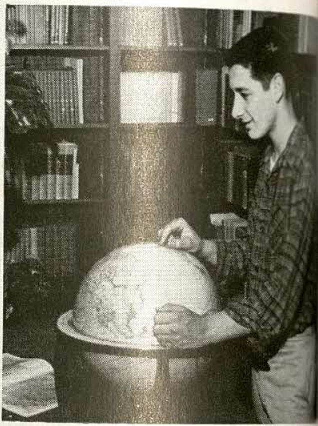
Provides Knowledge in Many Ways . . .

Pittsburgh Public Schools

BOOKS

National Film Board of Canada

MAGAZINES AND NEWSPAPERS


Los Angeles City Schools

GLOBES AND MAP

LIBRARY is a busy workshop where persons of all ages can seek knowledge. A library makes it possible for us to share the experiences of many other persons by reading about their thoughts and achievements. The books on library shelves give us the ideas and facts that men have collected for thousands of years. Libraries also provide up-to-date information in all fields with collections of books, newspapers, magazines, pamphlets, photographs, phonograph records, and motion pictures.

The library is sometimes called "the memory of the human race." It is like a giant brain that remembers all that scientists, historians, poets, philosophers, and others have thought and learned. It is a meeting place for the ideas and words of persons who have influenced the world. It is also a place where the experience of the past can meet the needs of the present.

Finding one certain book or phonograph record in a library could seem like trying to find buried treasure without a map. Therefore, libraries are organized to make it easy for us to find information quickly. We can all use the library for help in school work, for aid in our daily jobs, or for pleasure in our leisure time. Young people learn to use the library as part of their everyday school activities.

The word *library* comes from the Latin word *liber*, which means *book*. For hundreds of years, men built libraries only as places to keep books. But today there are many kinds of libraries for different purposes. *Public libraries* serve the general needs of cities, towns, villages, and some larger areas such as counties. *School libraries* aid students and teachers in elementary schools and high schools. *College and university libraries* provide needed books for advanced education. *Research libraries* house information for scientists and scholars. *Special libraries* serve the particular needs of various businesses and organizations.

Through the magic doors of your library, you can step into a world of adventure and learning. Today you may "travel" in your mind to the court of King Arthur and his knights. Tomorrow you may visit an American Indian family, or go voyaging to the Antarctic with a scientific expedition.

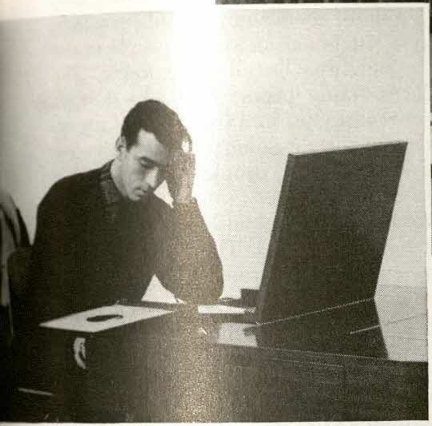
Many families today have a home library for reading and study. They may have novels and collections of short stories, as well as a set of reference books, a dictionary, and an atlas. They may also collect great works of literature and books on current events.

What a Public Library Does

The public library is one of the most important servants of its community. It provides knowledge and information on all subjects for everyone.

To borrow a book, a reader registers at the library and obtains a *library card*. Public libraries have *open stacks*, or books on shelves that are open to the public. Readers are free to browse and to take books from the shelves. The library may keep some books that are not for general use in *closed stacks*, or shelves not open to the public. Some public libraries have such large collections that they cannot put all their books on open shelves. These libraries provide a *call service* in which assistants called *pages* work in the stacks. They locate

Reavis High School, Oak Lawn, Ill.



Cincinnati Public Library

SOUND RECORDINGS

. . . for Everyone

the books readers request and send them to the reading room.

Large cities have a central library with many branch libraries in different areas. Smaller cities and towns may have a single central library. In rural areas, the library may be a traveling collection of books in a truck called a *bookmobile*. Cities often use bookmobiles to extend service into new areas.

Most public libraries divide their books and other materials into two departments, for children and for adults. Children who are learning to read can find books that will be easy for them to understand. Often one part of the adult department features books for young people. Adults can find many books to suit their needs and interests in the adult department. Some libraries, such as the Brooklyn Public Library, maintain separate facilities exclusively for children.

Services for Children are designed to attract boys and girls as they discover the wonderful world of books. The children's room of the public library usually has low tables and chairs, gay decorations, and displays that capture the children's interest. Librarians know that a child's first visit to the library can be a big step toward a lifelong interest in books. They make sure that the child wants to come back again.

Children's librarians choose books carefully, knowing that their books should interest children of all ages. In particular, they select picture books and animal stories for the youngest children, and provide plenty of adventure tales and stories about cowboys and Indians for older boys and girls. Sports stories and books on

The Microcard Corporation

Microcards and Microfilms contain tiny photographic copies of entire books. The reader enlarges each page in order to use it.

science and travel are also popular. Children are usually free to choose the books they want from the shelves. They form the habit of using books and enjoying them. They learn to use reference materials and to gather material for school assignments. Sometimes, after seeing a motion picture or television program, they want to read a book to gain more information about the topic of the film or program.

One of the popular features of the children's department is a story hour, usually held once a week. The librarian tells stories to children of school age, and uses picture books in story hours for preschool children. Sometimes the librarian uses recordings or films at the story hour. Some children's librarians have regular story hours on radio or television.

Creative activities are another important feature of the children's departments. The librarian encourages children to join summer vacation reading clubs. The library may even help form clubs for children who have special interests in stamps, astronomy, writing, puppets, dramatics, or poetry. The librarian plans programs to celebrate Book Week and other special national and community events.

If the library has a bookmobile serving remote neighborhoods or rural areas, children's books often make up the largest part of this library on wheels. A children's librarian is on the bookmobile whenever possible.

Services for Youth meet the needs of young people of high-school age. Many libraries have a trained youth service librarian to aid this group, and set aside a special part of the adult collections for these readers. This section has books especially interesting to young persons, and also many books that represent all types and fields of adult reading. The young people's section is usually considered a part of the adult department. Public library service for young people is one of the most recent developments in public library work.

Young people are often fond of adventure and sports stories, science fiction and other fantasies, and tall tales such as the story of Paul Bunyan. At the same time, they are just beginning to discover the world's great novels, plays, and poems. There is always a demand for books about hobbies, how-to-do-it books, and biographies. High-school readers want to know about etiquette and how to behave on a date. They also want vocational-guidance information about possible jobs and how to prepare for various fields of work.

The librarian plays an important part in guiding young readers to books. The librarian always tries to have an answer when someone says, "I liked this book. Do you have another one like it?" The librarian chooses another book that will stimulate the boy or girl to read further.

Boys and girls in high school are busy discovering many new things about the world in which they live. School courses introduce them to many subjects, from atoms to athletics. The books for young people in the library provide information on all these topics. The librarian introduces young people to books through book talks, discussion groups, film forums, and music-appreciation programs. The librarian uses many creative activities to encourage young people to read further along the lines of their interests.

Services for Adults. Most public libraries offer two main kinds of services for adults. They provide books to read for knowledge and pleasure. The other main service is answering questions.

Providing Books. Many persons ask for the books they want. But others do not know exactly what kinds of books they would like to read. The librarians give advice to these readers, and guide them to books that will be interesting or helpful. Most public libraries arrange their books according to subject matter so people can browse around, sampling various volumes until they find those that appeal to them. Librarians also set up colorful displays that tie books in with current events or with some local event or celebration. They use newspaper columns and radio and television programs to review new books and to stimulate interest in old ones.

The public library often sponsors discussion groups as part of its program of popular education. A library may set aside a special room for discussion groups. All the members of the group read a certain book and then discuss what it means to them. The group may discuss a film or a concert of recorded music. The library also may organize music appreciation groups and film forums. Some libraries make special efforts to encourage older persons to use books and other library materials.

Answering Questions. Reference librarians are called on to answer questions of all kinds. Someone may want to know the height of Mount Everest, or who won the World Series in 1929, or why Great Britain has a mild, damp climate, or where the word *chancellor* comes from.

The reference librarian has spent many years learning where to look for information. He or she uses general reference works, such as encyclopedias, almanacs, and dictionaries. For geographical information, he consults atlases, gazetteers, and globes. He finds biographical information in dictionaries of biography and in such books as *Who's Who in America.* Many organizations publish yearbooks of useful information. National, state, and local governments also publish books or pamphlets that provide information on many subjects. The reference librarian does not try to memorize all these facts. Instead, he is familiar with the quickest and most reliable sources of information. In most large cities, and in smaller cities that have special interests, such as glass or paper industries, the library provides books for intensive study in these fields.

For Young Children, the librarian tells stories or reads from popular children's books. She holds the book up so they can follow the story with the aid of many colorful illustrations.

Richmond (Va.) Public Schools

Other Services. Public libraries often have more than books. They keep collections of magazines and pamphlets, music scores, and files of clippings and pictures. They may have exhibits of paintings or arts and crafts. These collections are usually kept in some place where young people and adults can use them. The children's room usually has its own magazines, as well as pamphlet and picture files.

For many years, libraries stored bound volumes of newspapers. But the newspapers were bulky to handle, and took up needed space. After a few years, the paper they were printed on became brittle, and crumbled if the newspapers were used. Now, some newspapers supply spools of *microfilm* that contain tiny pictures of all the pages in the paper (see MICROFILM). Persons who use microfilm read it in a special *microfilm reader* that enlarges the image. Microfilm provides a permanent record and also saves space.

Some libraries have collections of phonograph records of great symphonies, operas, jazz, and folk music. They may have records containing dramatizations of plays and famous events in history, or of authors reading their own works. Large libraries sometimes have separate music rooms where listeners use earphones so they can hear records without disturbing others. Many libraries lend records to the public.

Many libraries use 16-millimeter motion-picture films for both entertainment and education. A large city library may have a collection of films that it lends to clubs, church groups, and other organizations. It may also have collections of *filmstrips*, each of which contains a series of pictures on one subject, such as conservation. Filmstrips can be projected on a screen or studied through special viewers.

Special Services. Public libraries are often asked to fill special needs. Blind persons need books in Braille, or special phonograph recordings called *talking books*. The Library of Congress supplies books in Braille and talking books to 28 public, state, and other libraries in various parts of the United States. These libraries serve as distributing centers. The National Institute for the Blind, in Toronto, furnishes the same service in Canada. Blind persons do not have to pay postage for sending and receiving these books in the United States or Canada. Many libraries provide machines that project the pages of a book on the ceiling for bedridden readers. See HANDICAPPED, THE (Special Agencies).

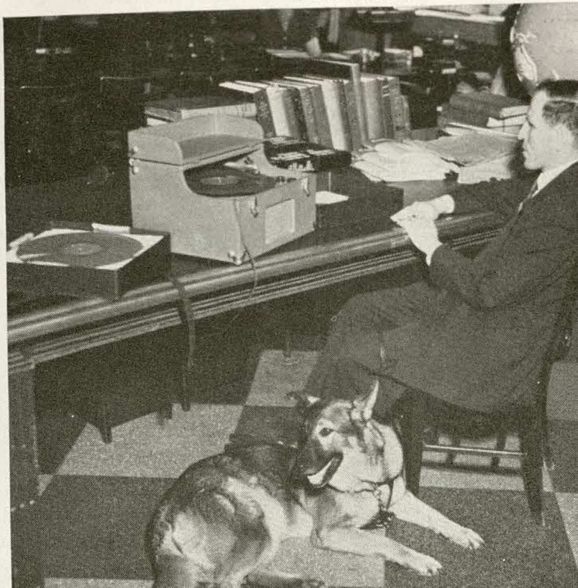
When any person doing research needs a special book that his library does not have, he may ask for an *interlibrary loan*. By this method, his library borrows the book from another library for his use. Sometimes he may need a map, chart, manuscript, or document that the library cannot lend him. But the library can usually obtain photographed copies, either *photostats* or microfilm.

How a Public Library Works

Choosing Books and Materials. Supplying people with the books they want is a challenging task. Librar-

For Those Who Cannot See, the library provides talking books on records, Braille books, and globes with raised surface features.

The Free Library of Philadelphia



FINDING KNOWLEDGE ON THE SHELF

Enoch Pratt Free Library, Baltimo

Clarke, Arthur Charles, 1917—

629.1 Clarke, Arthur Charles, 1917—
C597 Going into space, by Arthur Charles Clarke; illus. with photographs and diagrams. New York, Harper and Brothers, 1954.

AUTHOR CARD

Going into space

629.1 Clarke, Arthur Charles, 1917—
C597 Going into space, by Arthur Charles Clarke; illus. with photographs and diagrams. New York, Harper and Brothers, 1954.

TITLE CARD

Rockets (Aeronautics)

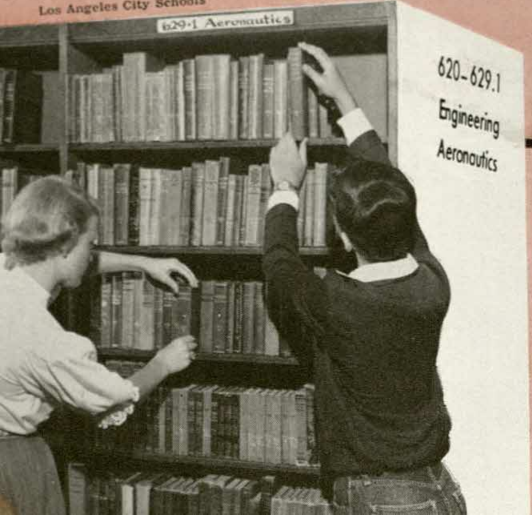
629.1 Clarke, Arthur Charles, 1917—
C597 Going into space, by Arthur Charles Clarke; illus. with photographs and diagrams. New York, Harper and Brothers, 1954.

SUBJECT CARD

The Card Catalog contains cards for every book in the library. The cards show the place where each book can be found on the shelves.

Author, Title, and Subject Cards refer to the book. Each book is listed at least three different places in the catalog. The reader can look for the book under its author, its title, or its general subject.

Los Angeles City Schools



On the Shelves, books are arranged in order by groups. Each book's identifying numbers appear on all cards that refer to it, as well as on its spine. Labels on the shelves lead each reader to the section he wants.

ians must keep up with the latest developments in every field. They must know about books in these fields so they may choose the best ones for the library.

Librarians have many helps in learning about the books they need. Several weekly supplements in newspapers, such as *The New York Times Book Review* and the *New York Herald Tribune Books*, give information about new books. The American Library Association publishes a *Booklist* which reviews new books and reference works twice a month. Librarians also use *Library Journal*, *Publishers' Weekly*, *Wilson Library Bulletin*, and *Book Review Digest*, a monthly summary of reviews of new books from magazines and newspapers. Children's librarians find additional information about new books in their field in *The Horn Book*, a monthly magazine, and the *Bulletin of the Children's Book Center* of the University of Chicago Library.

In addition, the H. W. Wilson Company, which publishes the *Readers' Guide to Periodical Literature*, issues a *Standard Catalog for Public Libraries*. This catalog contains a list of books that librarians in all parts of the United States and Canada consider important and basic for public libraries. It includes brief notes telling what the books contain, and a guide suggesting how they should be classified by subject. The Wilson Company also publishes a similar catalog for children's books, called the *Children's Catalog*, and a *Standard Catalog for High School Libraries*.

By far the most difficult part of selecting books is to choose, from the many good books available, the ones that will be most useful. No matter how much money a library has, there never seems to be enough to buy all the desired books. A library must consider the needs and interests of its readers, as well as the number, quality, and condition of its present books.

Librarians face the same problem in buying magazines, phonograph records, motion pictures, and filmstrips. They try to buy the materials that will be of the most help to the public. Many magazines contain reviews of new recordings, filmstrips, and educational films. Librarians use these guides in choosing materials.

Putting Knowledge on the Shelf. The librarian catalogs a new book, deciding where it will go on the shelf. A typist makes out subject cards for the card catalog. She also makes out author and title cards for the book. See the illustration on the opposite page of this article, Finding Knowledge on the Shelf.

Most libraries use a system of numbers to classify books (see DEWEY DECIMAL SYSTEM). When the librarian has classified the new book, a library clerk carefully marks its number on its *spine*, the part of the book that faces out from the shelf. If the library uses cards to charge out books to readers, the clerk pastes a card pocket inside the front or back cover. Now the book is ready to go on the shelf.

There are many ways of letting readers know that new books are available. Most libraries display their new books on a special shelf. Others issue lists of new books from time to time.

When a book begins to wear out, it is mended or sent to a bindery for rebinding. If the book is badly worn from constant use, the library decides whether to buy a new copy of the same book or to buy a more recent book on the same subject. If the book is old enough to be outdated, the library discards it and buys one that is more up to date.

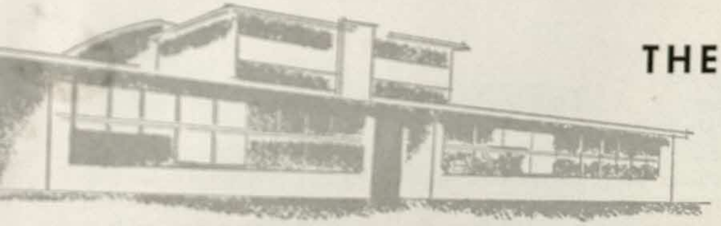
Public Library Standards. Librarians know they can always improve their services, reach more people, and provide better books. But they sometimes have difficulty obtaining enough money to carry on these programs. The American Library Association and state library agencies set *standards* for libraries. These standards offer convincing proof that even good libraries can be improved. There are also standards for recruiting and training librarians.

An American Library Association publication, *Public Library Service*, recommends various ways for local libraries to improve their services. It suggests that each public library system serving up to 100,000 persons should add between 4,000 and 5,000 new books to its collection every year. It also suggests the number and kinds of magazines, films, and recordings that libraries of various sizes should own.

Many libraries serve communities too small to afford all the books suggested in these standards. The Association suggests ways that local libraries may cooperate with one another. Three small libraries might not be able to afford a children's librarian in each community, but together they can afford to hire one. In the same way, small libraries may agree to share the books

Gaylord Bros., Inc.

Checking Books Out of the Library. Student assistants perform many routine tasks in the library, saving valuable time for the librarians. Librarians use many kinds of charging machines to make records of the books loaned to readers.



THE SCHOOL LIBRARY

The School Library teaches children how to find books and other materials, and how to use the many services offered by libraries.

Charlotte (N.C.) City Schools

The library is a pleasant place to read or just browse through a book. Children check out their own books and help with other tasks.

in their collections, and may work out ways to avoid buying the same books for each community.

The Library Administrator guides the work of the library. Some small public libraries have only one professionally trained librarian who may serve as children's librarian, cataloger, and administrator. But libraries in large cities may have as many as 300 full-time trained librarians and more than 700 other employees. Many of these large libraries have more than 1,000,000 books.

From the largest library to the smallest, the administrator's job is to guide the library's operations and to plan new ways to make it better and more effective. The director of a large library is like the president of a company. He prepares a budget, planning how the library will spend its money during the year. He picks the librarians to take charge of various services or activities. He sees to it that the library buys the best books from the thousands published every year. He carries out the policies of the library's board of directors, and represents the library to the public.

The Library Board usually includes educational and civic leaders in the community, and other interested citizens. They are elected or appointed to represent the interests of the people of the community. The board's major duties include establishing objectives and policies for the library, providing adequate financial support, supervising the ways funds are used, and maintaining the library's physical plant. The board establishes a close working relationship with the trained librarian who is responsible for the administration of the library.

Supporting the Library. Public libraries are usually supported by taxes. State and local laws determine what area the library will serve, and provide funds from taxes. Local taxes account for more than 87 cents of every dollar spent for libraries. In addition, public libraries may receive income from state grants or from *endowment* income (the interest on money given by the public), as well as from fines on overdue books.

A number of wealthy men have given large sums to support public library work. John Jacob Astor, Peter Cooper, and other philanthropists set up libraries that were then opened to the public. Enoch Pratt founded the Free Library of Baltimore, Md., on the condition that the institution would then be tax-supported. Andrew Carnegie gave money to build public library buildings in communities that promised to support the new libraries with taxes. During his lifetime, he gave money to build public libraries in 2,500 cities and towns in the United States, Canada, and Great Britain.

Private citizens aid in supporting public libraries in many ways. Many communities have local groups called *Friends of the Library* that encourage the public to provide money for the library and to extend its services. In some communities, the group is called the *Citizens Library Movement*. Groups such as these may agree to support some new library project with funds of their own. The Friends of the Library movement began to develop and spread in the early 1920's, and has spread from one community to another. It has no

The School Librarian helps students use the card catalog to find books for an assignment.

Pittsburgh Public Schools

Davidson County (Tenn.) Schools

Filmstrips containing information on many subjects are provided by the library for study through special viewers.

real national organization, but receives encouragement from the American Library Association.

County and Regional Libraries. Most public libraries serve only one city, but some can serve an entire county or several counties. Usually these libraries provide bookmobile service for outlying areas. They may set up small collections of books in many parts of the county or region. County and regional libraries often give valuable service to the schools in their areas. There are about 1,070 county and regional libraries in the United States, and others are being organized every year.

State Library Agencies

State library agencies perform many functions. No two of them operate in exactly the same way, but each state has a library or library agency that performs five basic services. These services include (1) providing general library services for state officials and employees; (2) promoting and expanding library services throughout the state; (3) collecting basic records and preserving the old documents that are part of the state's history; (4) keeping a complete file of all state laws; and (5) furnishing *legislative reference service* by giving advice and information to individual legislators and legislative committees.

There are about 150 state library agencies today. A few states have a single agency that performs all these functions. Others have four or five agencies. All states provide by law for library extension service. The extension service lends extra books and materials to public libraries that need them. It also encourages cities, towns, counties, and regions to form new libraries. The extension agency usually suggests standards for librarians and their work. In many states, the library agency stimulates special projects by giving grants of money to individual libraries. Some state library agencies provide direct library service to rural areas.

School Libraries

Elementary-School Libraries. The library is one of the busiest and most important parts of a school. It has three basic jobs in helping children learn. First, it provides books and other materials for the school's edu-

Library Materials supply information for classroom studies, as well as the latest information on special outside interests.

Sacramento City Unified School District

Behind the Scenes. Student assistants help the librarians keep the books in good repair, mending torn pages or broken covers.

Davidson County (Tenn.) Schools

cational program, carefully fitting them in with the needs of the children. Second, it helps the children develop an interest in reading, and stimulates their interest in many subjects. Third, it teaches them how to use a library. They will need this knowledge in high school, in college, and in later life.

About 13 of every 100 elementary schools in the United States have school libraries. Many other schools use small collections of books in each classroom. The field of library service in elementary schools is growing rapidly. School librarians believe many educational problems at all levels could be simplified if children had libraries in elementary schools.

Secondary-School Libraries are usually centers for all school teaching materials—books, magazines, pamphlets, pictures, motion pictures, filmstrips. Librarians select these materials in cooperation with teachers and students. They give reading guidance to students, and work closely with teachers in planning how to use the materials. They also experiment with new methods of teaching and new ways of using the library. Some school libraries even circulate textbooks that the students use in classroom work.

High-school libraries strive toward the same goals as the libraries in elementary schools. But the high-school library movement is older and more widespread. About 93 of every 100 high schools in the United States have school libraries. The high-school library is usually open all day. Classes sometimes come with their teachers to work on special projects. In addition, individual students visit the library to borrow a book, browse, see a film, or look up reference material. In a school with 1,000 students, as many as 350 may use the library in a single day. Most school libraries have student assistants to help in many phases of library work.

Librarians teach classes how to use reference tools in preparation for a classroom project. They talk to classes about books, and suggest books for leisure reading and for carrying out school assignments. Librarians may also provide personal, educational, and vocational guidance.

School Library Standards list the best conditions under which librarians can serve their schools. The American Library Association recommends that there should be one full-time trained librarian to serve every 250 students, and that a full-time clerical assistant should be available for every 500 students. According to these standards, a school with 1,000 students would have four librarians and two assistants.

Supervisors from state departments of education or from state libraries check the work of school libraries in 28 states. In addition, about 200 cities, towns, and counties employ school library supervisors.

Other Kinds of Libraries

College and University Libraries provide the books that students and faculty members need. They give students a chance to supplement their classroom work with independent study and research. These libraries have special collections of technical books and books in foreign languages. In addition to books and magazines, college and university libraries have large collections of scholarly journals, publications of various governments, manuscripts, microfilms, microcards, and microprints.

Some of the libraries at men's colleges are among the oldest in the United States. Amherst, Dartmouth, and Williams colleges have large collections. Women's colleges with large libraries include Mount Holyoke, Smith, Vassar, and Wellesley. Many coeducational schools, such as Antioch, Oberlin, Reed, and Swarthmore, also have excellent collections.

Most universities have very large libraries. About 20 universities in the United States have collections of more than 1,000,000 volumes each. Some university libraries make it easier for students to find the books they need by organizing their collections on a *divisional* basis. These libraries have separate reading rooms for such fields as social studies, the arts, and the sciences.

Research Libraries collect the results of scientific studies for the use of scientists and scholars. Many universities have large and important research libraries. Privately-supported universities such as Columbia, Harvard, Princeton, and Yale maintain extensive research collections. The state-supported universities in California, Illinois, Michigan, Minnesota, and Texas also have important research libraries. The Hoover Library, at Stanford University in California, has a large collection relating to World War I.

A number of research libraries were started as private collections. John Pierpont Morgan founded the Morgan Library. It has many medieval manuscripts and early printed books, including three copies of the Gutenberg Bible. The Folger Shakespeare Library in Washington, D.C., has a priceless collection of material about Shakespeare, his works, and the time in which he lived. The Henry E. Huntington Library in San Marino, Calif., serves research workers in the fields of art, English and American literature, and American history.

The Federal Government operates many research libraries, including the Library of Congress, the Department of Agriculture Library, the Armed Forces Medical Library, and the National Archives (see ARCHIVES, NATIONAL; LIBRARY OF CONGRESS). The Atomic Energy Commission operates libraries of scientific materials at its research centers in Oak Ridge, Tenn., and Los Alamos, N.M.

The New York Public Library and the Boston Public Library have outstanding collections of research materials. Many other public libraries have special collections. They include the Burton Historical Collection on the old Northwest Territory and the Great Lakes area in the Detroit Public Library and the John Griswold White collection of folklore and materials on the Orient in the Cleveland Public Library. Chicago has two privately-supported research libraries, the Newberry Library, with a collection of literature, genealogy, and history, and the John Crerar Library of scientific and technical information. These libraries are open to the public.

Because there are so many books, no single library could ever have all the materials its users might want. All major research libraries cooperate in a system of international and national interlibrary loans. In this way, one library can borrow a book from another library across the continent or around the world.

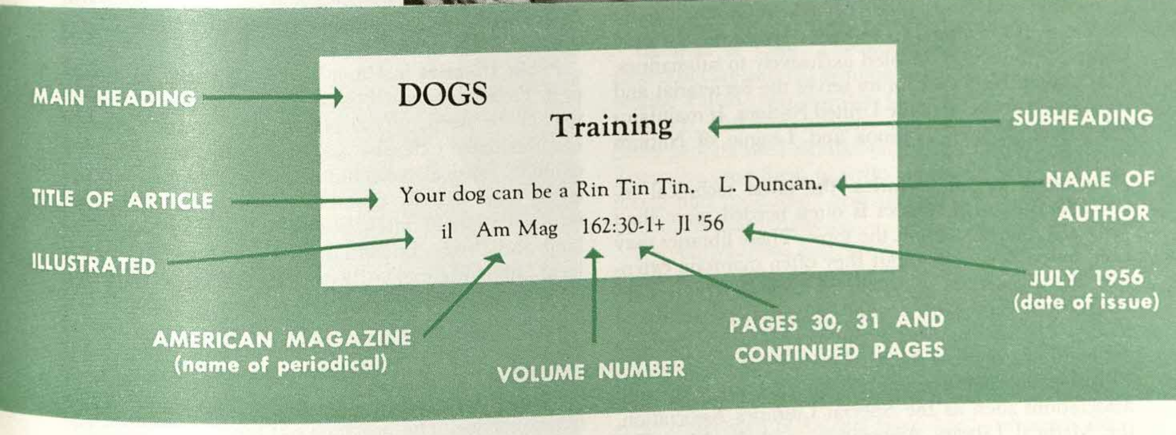
The Library of Congress maintains a *National Union Catalog*, listing the locations of more than 8,500,000 books in libraries in all parts of the United States and Canada. Denver, Philadelphia, and Seattle have smaller

FINDING INFORMATION IN MAGAZINES

Los Angeles City Schools; Sacramento City Unified School District

The Readers' Guide is an index to magazine articles. It lists articles by both subject and author in alphabetical order. It also tells the reader whether or not the article includes illustrations, diagrams, and tables.

Readers' Guide, H. W. Wilson Company


MAIN HEADING
DOGS
Training
SUBHEADING
TITLE OF ARTICLE
Your dog can be a Rin Tin Tin. L. Duncan.
NAME OF AUTHOR
il Am Mag 162:30-1+ Jl '56
ILLUSTRATED
JULY 1956 (date of issue)
PAGES 30, 31 AND CONTINUED PAGES
AMERICAN MAGAZINE (name of periodical)
VOLUME NUMBER

union catalogs as part of regional bibliographical centers. These centers help research workers find books that local libraries do not own. Canada, Great Britain, Germany, and other countries have union catalogs.

The Association of Research Libraries set up the *Farmington Plan* in 1948 to buy certain kinds of books published in other countries. Under the plan, each of 60 research libraries agreed to buy and share all the books in a certain field published in other countries. The National Union Catalog lists this material so that scholars can find it.

Eleven public and research libraries in the Boston area send little-used books to a cooperative warehouse at Brighton called the New England Deposit Library. Amherst, Mount Holyoke, and Smith colleges share a smaller storage library at South Hadley, Mass. The Midwest Inter-Library Center was opened in Chicago in 1951. It provides storage space for research libraries in eight midwestern states, and buys research materials that all these libraries share.

Special Libraries. Many business, professional, and religious organizations set up their own special libraries. These libraries serve the companies or groups that establish them. They are more than collections of books and information, because they provide services to meet the needs of their own organizations. For example,

Graham Warrington, Semmens and Simpson, Architects

The Main Public Library in Vancouver, B.C. was completed in 1957. Branch libraries serve the outlying areas. The library system has books on Canada and the history of the Northwest, as well as large collections of music books, scores, and records.

The World Book Encyclopedia Information Service answers reference questions for owners of the encyclopedia, and also provides information for the editors and artists who prepare and revise articles.

About 3,000 special libraries serve organizations in the United States and Canada. Almost half of them are scientific and technical collections. Among the oldest and best-known libraries are those of E. I. du Pont de Nemours and Company; Standard and Poor's Corporation; the Metropolitan Life Insurance Company; The New York Times Company; Procter & Gamble Company; and Time, Incorporated. At Groton, Conn., the General Dynamics Corporation maintains the only library in the world devoted exclusively to submarines. The United Nations Library serves the Secretariat and specialized agencies of the United Nations. It maintains files of all United Nations and League of Nations documents.

In many special libraries, the latest technical information about a subject is often needed more than general knowledge about the topic. These libraries may keep only a few books, but they often maintain extensive files of journals, unpublished research reports, clippings from newspapers, and government statistical reports. Special libraries have pioneered in new methods of handling and using this kind of material.

Special libraries cooperate with each other through associations such as the Special Libraries Association, the Medical Library Association, and the Music Library Association. Through meetings and journals, librarians exchange ideas on new sources and new ways to handle information. Many special libraries allow qualified persons outside their own organizations to use their materials.

Other Libraries. Hospitals often have libraries for their patients. Some public libraries provide hospital library service for patients. The librarians use bookracks on wheels that they roll from room to room. They load these racks with interesting books and magazines. Military bases have attractive libraries stocked with the latest books in popular fiction and other fields. Prison libraries contain many books that teach inmates useful trades and hobbies. Ocean liners and other ships often have well-stocked shelves of books for spare-time reading.

Canadian Libraries

Libraries in Canada serve both English-speaking and French-speaking peoples. They have developed special materials and techniques because of the country's geography, with its small population scattered over a vast area.

Canada has over 850 public and regional libraries. These include free libraries and collections set up by local library associations, as well as traveling libraries operated by counties and regions.

Public Libraries in Canada provide books in English or in French, or some books in each language, depending on the needs of the people they serve. Canadian libraries make extensive use of documentary films, art exhibits, musical collections, and microfilms. Ontario is the most heavily populated province, and has the most wide-spread public library system. The Newfoundland and Prince Edward Island governments support local public libraries. Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, and Saskatchewan make provincial grants toward local public library expenses.

Toronto has the largest public library system in Canada. Many other cities and towns have public library service. The province of Quebec supplies reference service through *La Bibliothèque Saint Sulpice*. This library was once a private collection owned by the Sulpician order of priests. It has many books on Canada.

Canada has been a pioneer in children's library work. The Canadian Library Association and more than 20 other national organizations sponsor Young Canada's Book Week each November. The celebrations focus attention on literature and library service for children.

Regional Libraries have grown up to serve the widespread population in rural Canada. They have developed many ways of serving persons in remote areas. Bookmobiles serve rural, suburban, and residential districts, and often provide books for school children. Patrons who live too far away for bookmobile service can borrow books by mail. Library service has been extended along the Alaska Highway.

The Fraser Valley of British Columbia has the oldest regional library in North America. It was founded in 1930. Libraries in Prince Edward Island and Newfoundland are organized on a province-wide regional system, and four regional library areas serve half of Nova Scotia. In 1950, Saskatchewan set up the first regional library on the Canadian prairies. This library at Prince Albert serves north-central Saskatchewan.

School Libraries are administered by each province. Most elementary schools have classroom libraries. High schools and collegiate institutes (special high schools) have central libraries. Architects now design special library areas for schools. Ontario and Saskatchewan have provincial supervisors for school libraries.

College and University Libraries in Canada range from small teaching collections to large institutions rich in research materials. Most colleges set up libraries as part of their original organizations. There are 268 university and college libraries in Canada, in addition to the collections in teachers' colleges.

Government Libraries. The provincial governments maintain legislative libraries and archives and libraries for the executive departments of the governments. Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, and Saskatchewan have library departments that supervise library work.

The Government of Canada maintains the Library of Parliament, founded in 1866; several departmental and divisional libraries; libraries connected with national agencies; and the National Library of Canada, which began operations in 1953. Almost all these libraries are in Ottawa. The Government maintains a total of more than 100 libraries.

The two most important projects of the National Library of Canada are preparing a national union catalog for Canada and publishing an annual and monthly national bibliography called *Canadiana*. The union catalog consists of microfilm copies of the catalog cards of many Canadian libraries.

Canada had no national library in 1946, when the Canadian Library Association and four other national organizations urged the Government to establish one. Parliament approved funds for the first step of the project, and set up the Bibliographic Centre of Canada at Ottawa in 1950. The Centre began the union catalog and bibliographic work that the National Library performs. A fire damaged the Library of Parliament in 1952. Many of its volumes were transferred to the National Library at that time. William Kaye Lamb became the first National Librarian of Canada in 1953. He had been Librarian of the University of British Columbia, and then Dominion Archivist, with the special duty of advising the Government on a national library.

Sacramento City Unified School District

The Vertical File contains pamphlets, newspaper and magazine clippings, mounted pictures, and other printed materials that cannot be kept on book shelves.

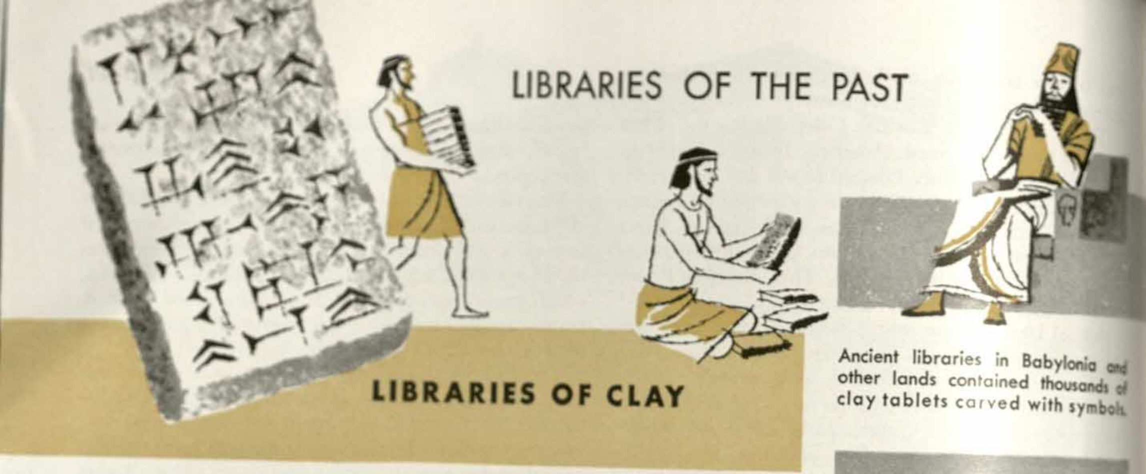
History

Libraries of Clay. The ancient Babylonians made tablets of clay and cut symbols into them in a system of writing called *cuneiform* (see CUNEIFORM). After about 4000 B.C., the Babylonians, the Assyrians, and many other peoples used similar tablets for keeping records. They also used them to write messages. Through commerce and conquest, these peoples carried cuneiform tablets westward to Egypt.

The Babylonians and Assyrians kept huge libraries of cuneiform tablets. Many of them lay buried for thousands of years. In 1853, a British archaeologist, Sir Henry Layard, discovered a great public library at Nineveh, near what is now Mosul, Iraq. The library held 10,000 clay tablets. An Assyrian king, Ashurbanipal, built the library during the 600's B.C. Other great collections of tablets have been recovered from such ancient cities as Ur, Nippur, Kish, and Tello. Tablets in these collections contain history, mythology, mathematics, and legal and commercial records. Some of the tablets found at Nippur contained part of the Code of Hammurabi (see HAMMURABI). Another famous record, the Story of Gilgamesh, was found in Nineveh. It tells the Babylonian story of the Flood.

Libraries of Papyrus. About the time the Babylonians were developing cuneiform writing, the Egyptians learned to make beautiful writing material from the papyrus plant. Papyrus became the standard writing material in all the lands around the Mediterranean Sea.

LIBRARIES OF THE PAST



Ancient libraries in Babylonia and other lands contained thousands of clay tablets carved with symbols.

The Egyptians made books from long sheets of papyrus. The Greeks also used papyrus, and built many libraries.

It was still used in many places in the A.D. 1100's. Papyrus sheets can be joined together easily, and the Egyptians usually used long papyrus scrolls for books. A scroll in the British Museum, the Harris papyrus, is 133 feet long. The Roman word for such a scroll was *volumen*, the origin of our word *volume*.

Papyrus decays rapidly unless it is carefully stored, and most of it disappeared before modern scientists could examine it. We know little about most Egyptian libraries. A library existed at Gizeh in the 2500's B.C. Amenhotep III had a library at Amarna in the 1400's B.C., and Ramses II founded one at Thebes about 150 years later. The Temple of Horus at Edfu (now Idfû), built in 237 B.C., was famous for its library.

The Greeks also used papyrus. Pisistratus, a ruler of Athens, probably founded the library there in the 500's B.C. The Greeks set up libraries in all the cities they founded, from Sicily to the Black Sea. Plato and Aristotle had famous collections of papyrus scrolls. Aristotle's scrolls were passed on until they became part of the most famous library in the ancient world, at Alexandria. Alexander the Great was Aristotle's pupil, and he learned the value of books from his teacher. He built Alexandria in 332 B.C., and his successor, Ptolemy I, founded a library there soon afterward. Scholars believe the library contained more than 500,000 scrolls, representing the literature of all the known world, as far away as India. Alexandria also had the first librarians. Many of them, including the poet and bibliographer Callimachus, are still famous. Under Alexander's successors, the library at Alexandria was the glory of the Hellenistic world. Parts of the library were destroyed during Julius Caesar's campaign in Egypt in 47 B.C. Later Roman sieges also destroyed much. According to tradition, the Arabs completed the destruction of the library in the A.D. 640's.

Libraries of Parchment. Other successors of Alexander the Great developed the city of Pergamum, near Constantinople, as a center of learning. When the library at Pergamum threatened to become more important than the one at Alexandria, the Alexandrians cut off its supply of papyrus. The people of Pergamum began writing on animal skins, and developed an improved material. They called this material *pergamentum*, the origin of our word *parchment*. But, in 41 B.C., Mark Antony took 200,000 scrolls from Pergamum and gave them to Cleopatra for the library at Alexandria.

Unlike papyrus, parchment cannot be joined together easily to make scrolls. Librarians sewed several sheets of parchment together along one side to make a *codex*, This form developed into the bound book. The Romans took books with them wherever they went, and set up libraries in the principal cities of their empire.

When the Roman Empire fell apart, scholars and monks preserved many of the parchment books. An important room in every monastery was the *scriptorium*, where monks carefully copied ancient books by hand. The monks reached great heights of artistic creation in illuminating, or decorating, their books. They also took libraries to all parts of the Christian world, from Persia to Ireland. Among the early libraries that have survived are those at St. Catherine's Monastery on Mount Sinai, founded in the A.D. 500's; at St. Gall, Switzerland, in the 600's; and at Mount Athos, Greece, in the 800's.

When universities first became important, in the 1200's, people outside the Roman Catholic clergy also became interested in the knowledge that books contained. Great princes built world-famous collections, such as that of Lorenzo de' Medici, which still exists in Florence, Italy. Hand-copied parchment books were so expensive and so scarce that early librarians chained them to the walls. Still, the few available books could not fill the demand for knowledge.

Libraries of Paper. The Chinese built libraries as early as the 300's B.C. But they made their greatest contribution to the development of libraries when they invented paper about A.D. 105. The use of paper spread westward through Arabia, and finally reached Europe about the 1100's. When Johannes Gutenberg printed with movable type on paper about 1440, he made it possible for more and more people to own books (see PAPER; PRINTING).

Monks and scholars founded libraries of parchment books in all Christian nations. The San Marcos Library at Lima, Peru, was established in 1551.

PARCHMENT

One great modern library was founded before Gutenberg's time. The Bibliothèque Nationale (or National Library) of France grew from a library founded in Paris in 1367. It is the largest library in Europe. The Roman Catholic Church founded the Vatican Library in the Vatican in 1447 as a library for handwritten manuscripts. Today it also contains printed books. These libraries have two of the largest and most important collections in the world.

In 1602, Oxford University established the Bodleian Library, the first library in England. It grew from a collection given by Humphrey, Duke of Gloucester, in 1444. The library has a priceless collection of rare books and manuscripts. In 1714, two libraries that have become giants were founded in Russia. One of them became the present Lenin Library in Moscow, and the other is now the Leningrad Public Library.

Paper and printing made possible the growth of many other great national collections, such as the library in the British Museum, founded in London in 1753, and the Library of Congress, established in Washington, D.C., in 1800.

Libraries in America. Colonists and explorers set up many libraries. In 1551, the Spaniards founded the oldest library in the Western Hemisphere as part of San Marcos University, in Lima, Peru. French settlers in Canada were not far behind. Marc Lescarbot, who lived in Acadia (now Nova Scotia) in 1606, loaned his personal library freely. A Jesuit mission set up a library in Quebec in 1632. Some volumes in the present library of Laval University were part of that early collection. The Jesuits established the first college library in North America, at Quebec City, in 1635.

The English colonists brought books with them to America, and soon received help from England in setting up a college library. John Harvard left almost 400 books to Harvard College when he died in 1638, two years after the school was founded. The College of

Benjamin Franklin established the Library Company in Philadelphia in 1731. It was the first lending library in the United States. Its collection of books still exists.

FIRST LENDING LIBRARY IN AMERICA

Globe and Mail Ltd., Toronto

Books Are Worth Their Weight in Gold to hospital patients. Many libraries furnish bedside service with bookracks on wheels.

William and Mary also had a library soon after it was founded in 1693.

The colonists developed many new ideas of library service. Benjamin Franklin founded the first *subscription* library, the Library Company of Philadelphia, in 1731. He formed a company in which each member contributed money to buy books. The members could use the books free of charge. This collection still exists. In 1744, the Charles Town Library Society started a similar collection that the people of Charleston, S.C., still use. Another subscription library, the Redwood Library, was established in Newport, R.I., in 1747. The following year, readers in New York City founded a library society. In 1779, citizens in Quebec City tried to unite English and French-speaking Canadians by founding a library that had books in each language.

The American colonies also produced great book collectors, including such colonial leaders as Increase Mather, William Byrd, Benjamin Franklin, and Thomas Jefferson. After the first Library of Congress was burned during the War of 1812, Jefferson sold his library to Congress in 1815. The Library of Congress grew up around his collection.

Public libraries had their beginning in the United States. Peterborough, N. H., set up the first free tax-supported public library in 1833. The idea quickly became popular, and many communities began providing free public library service for their citizens. The Boston Public Library, opened in 1854, was the first library authorized by a state legislature.

The United States has pioneered in many other fields of library service. Van Wert County, Ohio, organized the first county library in 1898. The library began its work three years later. Also in 1901, Charles McCarthy, a Wisconsin political scientist, founded the first official reference library and bill-drafting service in the United States, to serve the Wisconsin state legislature. Other states quickly copied his idea, and the Library of Congress set up its Legislative Reference Service in 1915.

The United States Government began supporting library service for the blind in 1897. It increased its program in this field in 1931, establishing collections of Braille books and talking-book records at designated libraries in all parts of the country.

Not every country has public library service today. The United States stimulated the public-library movement abroad when it set up United States Information

The Free Library of Philadelphia

Audio-Visual Aids include sound recordings, filmstrips, and other materials. Listeners use earphones so others nearby will not be disturbed.

Brooklyn Public Library

Bookmobiles Take Books to the People. Many persons think they serve only rural areas, but cities also have them. Some cities use bookmobiles to reach areas that have no branch libraries.

Agency libraries in many cities of the world after World War II. These libraries provide free information about American history, customs, and life today. The American Memorial Library, built in West Berlin in 1954 with American funds, represents American ideals of public library service. It stands as a peaceful monument to the American occupation of Germany after World War II.

The United States began giving assistance to public library service in rural areas in 1956, under the provisions of the Library Services Act. The Government agreed to provide as much as $7,500,000 in grants to the states on a matching basis each year for five years. The money was for use in furthering public library service to rural areas that did not have any libraries, or had inadequate library service. In the first year, $2,050,000 was appropriated for this purpose. The states agreed to provide at least as much money for rural library service as they had before the Act was passed. The states determined how the money could be used to promote rural library service. Some states expanded their state library extension services, while others supported local rural libraries. A third method was to provide funds for local public libraries to extend their services into rural areas.

Famous Librarians

The biographies of several famous librarians are listed in the BIOGRAPHY section of the READING AND STUDY GUIDE. Other famous librarians include:

Bostwick, Arthur Elmore (1860-1942), guided the development of the St. Louis Public Library for 28 years. He served as its librarian from 1909 to 1938. Bostwick was president of the American Library Association in 1907-1908, and also served it in many other offices. He was born in Litchfield, Conn., and was graduated from Yale University. He wrote *The American Public Library* and *Life with Men and Books*.

Green, Samuel Swett (1837-1918), made the Worcester (Mass.) Free Library one of the most progressive in the world. He started many new practices in library service, such as opening the library on Sundays. Green was born in Worcester, and was graduated from Harvard University and Harvard Divinity School. He was a founder of the American Library Association, and served as its president in 1891. He wrote *Library Aids*, *Libraries and Schools*, and *The Public Library Movement in the United States*.

Hewins, Caroline Maria (1846-1926), was a leader in promoting library service for children. She wrote two famous books in this field, *Books for the Young* and *Books for Boys and Girls*. She was born in Roxbury, Mass., and received library training at the Boston Athenaeum. She was librarian of the Hartford Library Association for 17 years, and became head of the Hartford Public Library in 1892.

Mumford, Lawrence Quincy (1903-   ), became

FAMOUS LIBRARIES OF THE WORLD

United States. The New York Public Library, on Fifth Avenue, is part of the largest public library system in the world.

Ewing Galloway

Great Britain. The Bodleian Library of Oxford University, founded in 1602, grew from a collection given to the university in the 1440's.

Art Institute of Chicago

Brazil. The Public Library at São Paulo has a large auditorium, as well as soundproof rooms for music and for research.

Brazilian Government Trade Bureau

Librarian of Congress in 1954. He was the first graduate of a library school to hold the position. Mumford was born in Ayden, N.C., and studied library science at Columbia University. He served as president of the American Library Association in 1954-1955. Before he went to the Library of Congress, he had been director of the Cleveland Public Library.

Stevenson, Burton Egbert (1872-), founded the American Library in Paris in 1918. He directed the library from 1918 to 1920, and again from 1926 to 1930. Stevenson was born in Chillicothe, Ohio, and studied at Princeton University. He returned to Chillicothe in 1899 to direct the public library. He became widely known as editor of *The Home Book of Verse*, *The Home Book of Quotations*, and *The Home Book of Shakespeare Quotations*.

Careers in Library Work

Librarianship is a rapidly growing field. There are many more positions for professionally trained librarians than there are qualified persons to fill them. Librarianship offers many rewards for men and women who enjoy working with people and books.

Personality Requirements are all-important for librarians. Today's librarian must be far more than just a person who loves books and likes to keep them in order on the shelves. He or she must administer a complex organization, interpret many types of information, do research work, maintain good public relations, manage personnel, and, sometimes, be an expert in child psychology.

To do all these jobs, librarians must not only like books, but also be energetic, imaginative, and capable of adjusting to new conditions and new techniques. They must be dedicated to ideals of service. Whether they work with children or research scientists, college students or housewives, they must find real satisfaction in bringing people and books together.

Training. Young persons will find many rewarding opportunities in modern libraries. There are more than 30 library schools in the United States and Canada, accredited by the Board of Education of the American Library Association, where students can prepare for library work. For a list of these accredited library schools, write to the American Library Association, Board of Education for Librarianship, 50 East Huron Street, Chicago 11, Ill.

Most library schools require entering students to have a college bachelor's degree or its equivalent, and to be able to read at least one language besides English. Probably the best general preparation for library school

Germany. The American Memorial Library in Berlin has the largest children's department in Germany. It was completed in the 1950's.

Gnilka, Berlin

is a general course in college, with some emphasis on the sciences, social sciences, and humanities.

Some colleges offer undergraduate courses in librarianship. Graduates of these courses usually return to library school to earn a master's degree, the basic professional librarian's degree. A few library schools offer the degree of doctor of philosophy (Ph.D.) for those who wish to do research and prepare for greater responsibility. In 1928, the Graduate Library School of the University of Chicago became the first to offer the Ph.D. in librarianship. A number of other schools, including Columbia University, the University of California, the University of Illinois, the University of Michigan, and Western Reserve University, offer similar programs.

Special libraries and large public and university libraries need trained librarians who also have good qualifications in some other field, such as economics or chemistry. Many librarians in these libraries take library training after earning master's degrees in other fields. In most cases, librarians with this double training can expect slightly higher salaries than persons who have specialized in only one field.

There is also a growing need for librarians who can organize collections and work with readers in areas where once there were no libraries, or only inadequate libraries.

Working Conditions for librarians have improved greatly in recent years. Librarians have made a determined effort to raise the standards of librarianship and to improve library education. Educators, administrators, public officials, and others have become aware of the vital contribution a good library makes to the community or organization it serves. In many colleges and universities, members of the library staff have equal rank with teachers. The head librarian of a public library is usually considered an official of the city government. Special librarians rank as important members of the research teams in their organizations. Librarians earn salaries that equal those of teachers.

The conditions under which the librarian works vary with the kind of library. New library buildings of all kinds emphasize comfort for the librarians, as well as for the public. Libraries connected with businesses and industries are usually part of the research centers they serve. Children's librarians generally work in one of the most attractive rooms of the library, planned and decorated to meet the special needs of youngsters.

Library Associations serve the members of the profession in many ways. They suggest ways for maintain-

France. The Bibliothèque Nationale in Paris admits only scholars conducting research on cultural subjects. It strives to obtain copies of all reference works published in every country.

Bibliothèque Nationale, Paris

Italy. The Vatican Library has three collections: official documents of the Roman Catholic Church, manuscripts, and reference works.

The Vatican Library

ing and improving professional standards. They allow librarians to share their ideas and their solutions to problems. The largest general professional organization is the American Library Association. A similar organization, the Canadian Library Association, operates in Canada. See AMERICAN LIBRARY ASSOCIATION; CANADIAN LIBRARY ASSOCIATION.

There are many groups within the American and Canadian Library associations that deal with specific aspects of library work. They include the Division of Libraries for Children and Young People and its Canadian counterpart, the Canadian Association of Children's Librarians, the Public Libraries Division, the American Association of School Librarians, and the Division of Cataloging and Classification. Many groups of librarians in the United States have set up separate professional organizations to deal with special problems. Some of the most important of these include the American Documentation Institute, the Catholic Library Association, and the Special Libraries Association (see CATHOLIC LIBRARY ASSOCIATION; SPECIAL LIBRARIES ASSOCIATION). The Council of National Library Associations acts as a clearinghouse for these organizations.

American librarians are also active in international library affairs. The International Relations Board, set up by the American Library Association, promotes exchange programs for librarians with other countries. It also helps share professional ideas and information with librarians in other lands. American and Canadian librarians take part in the International Federation of Library Associations. This organization promotes library cooperation among the nations of the world, and studies problems of international relations among libraries, library associations, bibliographers, and others in library work. RALPH A. ULVELING, in cooperation with: LESTER ASHEIM, Careers in Library Work; VERNER W. CLAPP, History; DONALD CONEY, College and University Libraries, Research Libraries; CAROLYN W. FIELD, Services for Children; RUTH W. GREGORY, Public Libraries; MARIAN E. LUCIUS, Special Libraries; MARY HELEN MAHAR, School Libraries; ELIZABETH HOMER MORTON, Canadian Libraries; MARGARET C. SCOGGIN, Services for Youth.

Related Articles. See the BIOGRAPHY section of the READING AND STUDY GUIDE under the heading Librarians for biographies relating to the library. See the Libraries sections of the articles on states, provinces, countries, and large cities. See also the following articles:

FAMOUS LIBRARIES

Alexandrian Library
Bibliothèque Nationale
Bodleian Library
British Museum
Folger Shakespeare Library
Library of Congress
New York Public Library
Vatican Library

LIBRARY ASSOCIATIONS

American Library Association
Canadian Library Association
Catholic Library Association
Special Libraries Association

UNCLASSIFIED

Book
Book Collecting
Book Week
Bookbinding
Bookmobile
Caldecott Medal
Carnegie Corporation of New York
Carnegie Libraries
Communication
Literature
Literature for Children (Special Collections)
Manuscript
Microfilm
Newbery Medal
Photograph
Photographic Copying
Reading

Outline

I. What a Public Library Does
- A. Services for Children
- B. Services for Youth
- C. Services for Adults
  - 1. Providing Books
  - 2. Answering Questions
- D. Other Services
- E. Special Services

II. How a Public Library Works
- A. Choosing Books and Materials
- B. Putting Knowledge on the Shelf
- C. Public Library Standards
- D. The Library Administrator
- E. The Library Board
- F. Supporting the Library
- G. County and Regional Libraries

III. State Library Agencies

IV. School Libraries
- A. Elementary-School Libraries
- B. Secondary-School Libraries
- C. School Library Standards

V. Other Kinds of Libraries
- A. College and University Libraries
- B. Research Libraries
- C. Special Libraries
- D. Other Libraries

VI. Canadian Libraries
- A. Public Libraries
- B. Regional Libraries
- C. School Libraries
- D. College and University Libraries
- E. Government Libraries

VII. History
- A. Libraries of Clay
- B. Libraries of Papyrus
- C. Libraries of Parchment
- D. Libraries of Paper
- E. Libraries in America

VIII. Famous Librarians

IX. Careers in Library Work
- A. Personality Requirements
- B. Training
- C. Working Conditions
- D. Library Associations

Questions

What materials are commonly found in libraries?

What is an *open shelf* system? A *card catalog?*

How have libraries solved the problem of storing old issues of newspapers?

What is a *special* library? A *research* library?

Where was the first tax-supported free public library in the United States?

What are the qualifications of a good librarian?

How do many Canadian libraries serve the small and scattered population in their communities?

Where was the first university library in the Western Hemisphere?

What tools are used frequently by the reference librarian?

How is the United States Government encouraging library services in rural areas?

Library of Congress

The Imposing Central Desk of the Library of Congress, Washington, D.C., is the nerve center of the greatest research library in the United States. Scholars from all parts of the world come to the Library of Congress to study rare books and manuscripts.

LIBRARY OF CONGRESS, located just east of the United States Capitol, is one of the largest and most valuable research libraries in the world. It has more than 12,000,000 books and pamphlets, and millions of charts, manuscripts, maps, musical compositions, engravings, lithographs, and other items.

The library owns the United States' largest collection of *incunabula*, or books printed before 1501. They represent the earliest products of the printing press, which was invented about 1450. The incunabula collection has 5,600 books. About 3,000 of them, known as the Vollbehr collection, were bought in 1930 at a cost of $1,500,000. This collection includes a perfect copy of the Gutenberg Bible, the first important book printed in the Western World. The library also has outstanding collections in law, science and technology, American history, and many other fields. Its collections of Chinese, Japanese, and Russian materials are the largest in the world outside the Far East and Russia.

The library's first responsibility is to provide research and reference assistance to Congress. But it also serves government agencies, other libraries, scholars, and the general public. The library and the Capitol are connected by a *book tunnel*, an endless-chain system that carries books to and from the halls where the nation's laws are made.

Congress established the Library of Congress in 1800, and appropriated $5,000 to buy books. By 1814, the collection included about 3,000 volumes and 50 maps and charts, and was housed in one room of the Capitol. But the British burned the Capitol that year, and all the books were destroyed.

Congress immediately began building up a new library. In 1815, it bought the private library of Thomas Jefferson for $23,950. This collection of more than 6,000 volumes formed the nucleus around which the Library of Congress was rebuilt. But, in 1851, when the library had grown to 55,000 volumes, fire again damaged the building. About 35,000 volumes were destroyed.

The library then began to receive regular appropriations from Congress to build its collections. Since 1870, it has been entitled to receive two copies of every publication for which an author requests copyright protection in the United States. These books, and many gifts, have done much to help build the library's huge collection.

By 1897, the Library of Congress had grown so big that it could no longer be housed in the Capitol. It was moved to the larger building that it now occupies. In 1938, an annex of white Georgia marble, with shelf space for 10,000,000 volumes, was added to the old library building. Together, the two buildings have about 36 acres of floor space, and cover 13 acres of ground. The buildings are valued at more than $22,000,-

000. The library acquired its 10,000,000th book in 1954.

The Library of Congress develops its own book classification system. In addition to its own card catalog, it maintains a national union catalog that provides information on the location of 9,000,000 books in more than 700 libraries in the United States and Canada.

The President of the United States, with the consent of the Senate, appoints the Librarian of Congress, who administers the library. A staff of trained officers, including librarians and outstanding scholars, serves the many persons who come to the Library of Congress for research in special fields. ELIZABETH E. HAMER

See also HANDICAPPED, THE (Special Agencies); LIBRARY; MACLEISH, ARCHIBALD; PUTNAM, HERBERT.

LIBRETTO, *lih BRET oh*, is an Italian word used in music to mean the words or text of an opera, operetta, or oratorio. Many composers write their own librettos. Others adapt well-known books or plays, or collaborate with authors.

LIBREVILLE (pop. 17,868; alt. 39 ft.) is the capital of Gabon, one of the republics formed from French Equatorial Africa in 1960. It lies on the Gulf of Guinea. For location, see FRENCH EQUATORIAL AFRICA (map).

LIBYA, *LIHB ih uh*, is an independent kingdom on the coast of North Africa. It has three provinces (Tripolitania, Cyrenaica, and Fezzan) and two official capitals, Tripoli and Bengasi, or Banghāzī. The national assembly meets at Tripoli, and the king lives in Bengasi. The name of the country in Arabic, the official language, is AL MAMLAKA AL LIBIYYA AL MUTTAHIDA, meaning the UNITED KINGDOM OF LIBYA in English.

Libya is about one fifth the size of the United States, but the United States has about 170 times as many people. Most Libyans live in a narrow strip of land along the Mediterranean Sea. The rest of Libya forms part of the great Sahara desert. In ancient times, Libya served as a rich source of grain and oil for the Roman Empire. It became an Italian colony in 1912. The Italians built roads, planted trees, and started irrigation projects. They built modern towns alongside ancient settlements. Libya became independent in 1951, but it is still chiefly a desert land, with Moslem mosques, camel caravans, and wandering tribes.

FACTS IN BRIEF

Type of Government: Constitutional monarchy.
Capitals: Tripoli and Bengasi.
Head of State: King.

Parliament: Senate of 24 members (8-year terms) and house of representatives of 55 members (4-year terms).

Area: 697,350 sq. mi. *Greatest distance:* (north-south) 890 mi.; (east-west) 990 mi. *Coast line*, 1,300 mi.

Elevation: *Highest*, Picco Bette (7,500 feet above sea level). *Lowest*, sea level.

Population: 1,091,830. *Density*, 2 persons per sq. mi. *Distribution*, rural, 79 per cent; urban, 21 per cent.

Chief Products: *Agriculture*, barley, camels, dates, fruits, goats, sheep, vegetables. *Fishing*, sponges, tuna.

Flag: Horizontal stripes of red, black, and green (top to bottom). A white crescent and star are in the black stripe. See FLAG (color picture, Flags of Africa).

National Anthem: "Annashid Al-Watany Al-Liby" ("The National Anthem of Libya").

Money: *Basic unit*, Libyan pound. One hundred piasters equal one pound. For the value of the Libyan pound in dollars, see MONEY (table, Values). See also PIASTER.

The Land and Its Resources

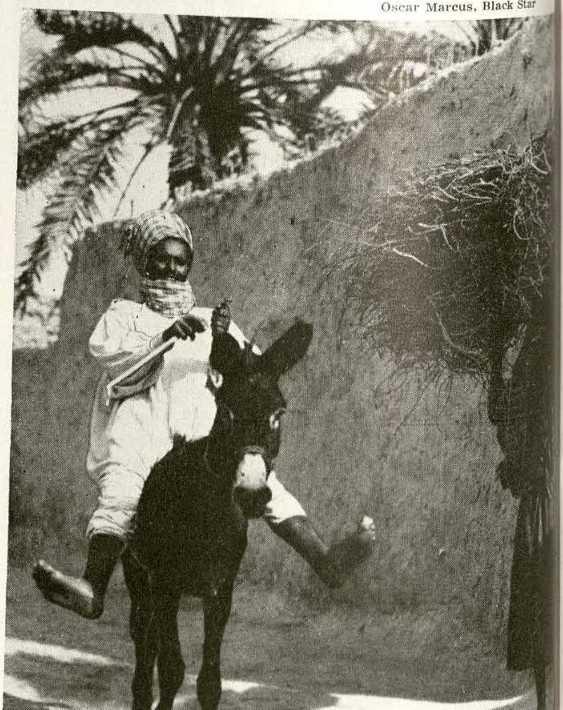
Location, Size, and Surface Features. Libya covers 697,350 square miles. Its coast stretches about 1,300 miles along the Mediterranean Sea. The *map* shows that Tunisia and Algeria lie to the west. Chad and Niger are on the border of Libya to the south, and the

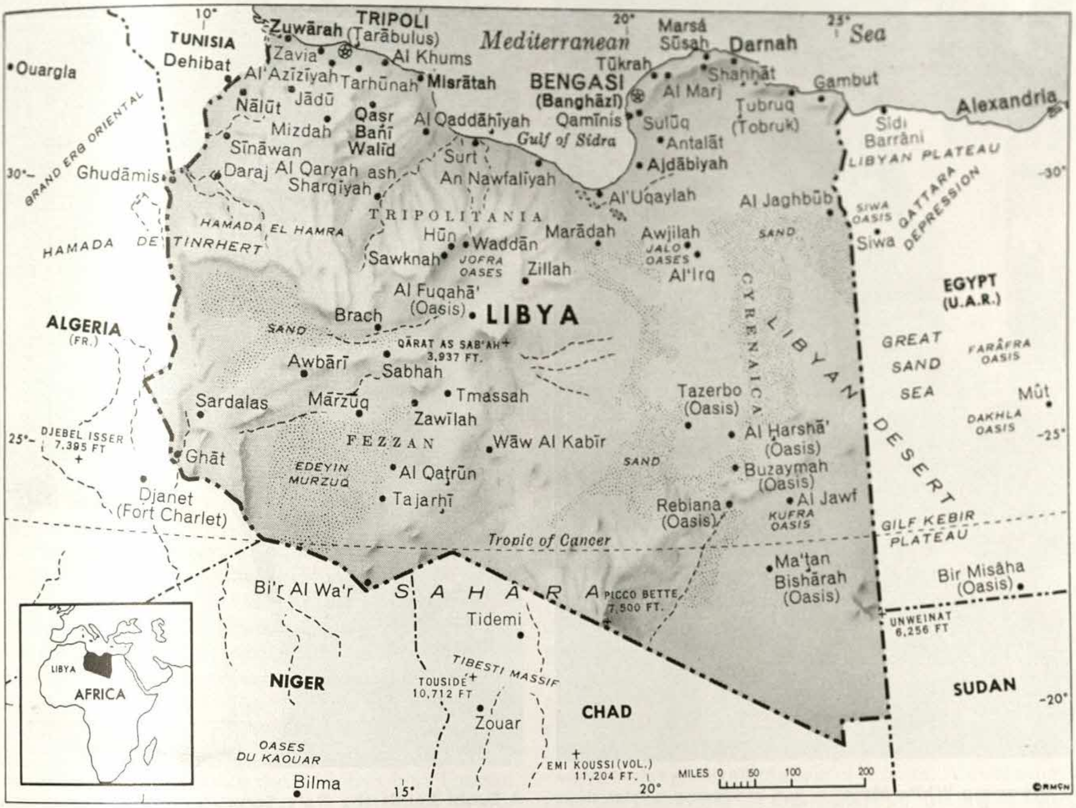
Open-Air Markets serve as trading centers in Libya. A customer bargains with a baker, *below*, for a flat loaf of bread.

Pix

Transportation in Libya depends largely on donkeys and camels. The country has few paved roads and only two rail lines.

Oscar Marcus, Black Star





Sudan and Egypt to the east. Libya has no rivers or lakes. Fertile regions are found along the coast, but they cover less than one half of one per cent of the land. Behind them lies a belt of dry plateau land, and south of that, the sand dunes and rocky surfaces of the desert. The Sahara covers over 90 per cent of Libya. Libya has a few green oases, formed by underground springs. Some lie near the northwestern coast between Tunisia and Misrātah. Libya's chief cities, including Tripoli, are in this stretch. Oases in Fezzan province include Jofra, Al Fuqahā, Sabhah, and Ghāt. Those in Cyrenaica (which lies in the Libyan Desert part of the Sahara) include Jalo and Kufra.

Natural Resources. Libya has little natural vegetation. In fact, about 50 miles from the coast, all vegetation disappears. The country has no important mineral deposits, and few sources of fuel or power for the country's industrial development.

Climate. The Mediterranean belt of Libya has a pleasant climate, with temperatures ranging from a January average of 52° F. to 85° F. in July. Rainfall is light in all parts of the country. Tripoli, for instance, has an average annual rainfall of about 13 inches. Droughts are common along the coast. Almost no rain falls from May to October. The desert has hot days and cool nights. Libya had the highest temperature ever recorded, 136° F. at Azizia on Sept. 13, 1922.

Life of the People

The People. Libya has a population of 1,091,830. The great majority are of Arab and Berber origin (see BERBER), and are Moslems. Many Berbers have intermarried with other groups. There are about 50,000 Christians and 30,000 Jews. The official language is Arabic. Islam is the state religion, but Libya grants complete freedom of worship to all religions.

Cities. The two largest cities are Tripoli (pop. 144,616) and Bengasi (56,325). They both serve as capitals of the country. Tobruk (4,500) was the scene of heavy fighting between British and German troops during World War II. See BENGASI; TOBRUK; TRIPOLI. Other cities include Darnah (20,782), Qasr Banī Walīd (14,000), Al Marj (10,000), Zuwārah (8,500), Ajdābiyah (5,971), Misrātah (5,000), and Nālūt (4,750).

Work of the People

Agriculture. About 80 per cent of the people raise livestock, including fat-tailed sheep, camels, and goats. Over half these people are nomads. The Libyans use the camels for their meat and milk and also for transportation. Crops are raised in the north and in the oases. The chief crop is barley. Libyan farmers grow esparto grass, and such vegetables as beans, carrots, onions, and tomatoes. Date palms thrive in the desert oases, along with almond, apricot, fig, and orange trees. Northern Libya has olive orchards.

The agricultural problems of Libya are among the most difficult in the world, because the land is poor and water is scarce. The United Nations has helped the country by sending experts to show the Libyan people how they can modernize their agricultural methods and develop new water sources for their fields.

Burton Holmes, Ewing Galloway

A Gleaming White Mosque, with its towering minaret, shines in the sunlight of the picturesque city of Homs, near Tripoli.

Oscar Marcus, Black Star

A Rabbi Reads the Holy Script from a scroll enshrined in an underground synagogue in the coastal village of Tigrinna.

Fishing for sponges has been carried on along the eastern coast since 1885. Tuna fishing in the Mediterranean also is important.

Transportation and Communication. Libya has two railroad lines, with a total of about 200 miles of tracks. They operate out of the two capitals. The Italians built a hard-surfaced motor road 1,250 miles from Tunisia to the Egyptian border. A branch runs southward from Tobruk to the oasis of Al Jaghbūb. Libya has only a few miles of other roads. Most Libyans still travel by camel caravan. Caravans, for instance, carry ostrich feathers from central Africa to Tripoli. They are then shipped to London and Paris to be used for trimmings and decorations. Airlines make regular stops in Libya. Wheelus Field, near Tripoli, is a United States Air Force base. Ships call at the two capitals and Tobruk.

Telephone and telegraph lines link the coastal cities of Libya, and telegraph service is also available to some of the desert oases. Both capitals of the country have radio stations.

Social and Cultural Activities

Education. Libya has only about 400 public schools. The few Libyans who attend go chiefly to Moslem schools, where they study the Koran, or Moslem Bible (see KORAN; MOSLEMS). There also are many Jewish schools. About 85 per cent of the people cannot read or write. There are few teachers, and most schools were damaged or destroyed during World War II. The Libyan government, with the help of the United Nations, is working hard to increase the number of teachers and to expand student enrollment. The University of Libya was founded in 1956 in Bengasi.

The Arts. In general, the countries that have controlled Libya have not interfered with local customs. The Libyans are skilled in such arts as weaving carpets, embroidering fabrics in gold and silver, and making metal and leather articles. The ancient Greek and Phoenician culture of Libya has long been forgotten, but it is evident in the ruins of buried cities. American archaeologists began to explore these ruins in the 1900's. Fine statues, carvings, and mosaics have been uncovered in many places, including Sabratha, Tolmeta, and Shaḥḥāt.

Government

Libya is a constitutional monarchy. The king is head of state. The head of government is a prime minister appointed by the king. The Libyan parliament consists of two houses: (1) a senate of 24 members (eight from each province), one half being indirectly elected, and the other half appointed by the king; and (2) a house of representatives of 55 elected members (35 from Tripolitania, 15 from Cyrenaica, and 5 from Fezzan). The king can dissolve parliament at will. Senators serve eight-year terms, and deputies, four. Libya has a supreme court, with judges appointed by the king. The leading political party is the Independence (Istiqlal) party.

The king appoints a governor, or *wali*, for each province of Libya. Each province also has an executive and legislative council, three fourths of whose members are elected. The king appoints the other one fourth.

History

The Phoenicians were the first known settlers in western Libya, 3,500 years ago. The Greeks colonized eastern Libya more than 2,500 years ago. They called all of North Africa Libya. Both these regions were ruled in turn by the Ptolemies of Egypt (323-264 B.C.), the Romans (264-146 B.C.), Byzantines, Vandals (A.D. 400's), Arabs (A.D. 600's), and Turks.

The United States fought a war against the Barbary pirates from 1801 to 1805. The storming of Tripoli in 1805 led to the well-known words in the Marines' Hymn, "to the shores of Tripoli." See BARBARY STATES.

In 1911, Italy declared war on the Turks who had held Libya since the 1500's. A peace treaty signed with Turkey in 1912 gave Italy authority over the region. But Italy could not subdue rebellious tribes until 1928.

At first, Italy governed Libya as two provinces, Cyrenaica and Tripolitania. Later, the country was split into four provinces (Tripoli, Misrātah, Bengasi, and Darnah), and a military territory.

During World War II, Libya was the scene of important battles. German and British armies fought back and forth along the northern border. The important Libyan cities changed hands several times. The British advanced as far west as Al 'Uqaylah in January, 1941, and the Germans reached El Alamein in Egypt in June, 1942. Allied troops landed in November, 1942. They pushed the German troops out of Libya into Tunisia. Tripolitania and Cyrenaica were placed under British control, and Fezzan under the French.

At the end of the war, Italy was compelled to renounce sovereignty over Libya. The Italian Peace Treaty provided that the future of Libya be decided by the Big Four (France, Great Britain, Russia, and the United States). They could not agree, and placed the future of the country in the hands of the United Nations General Assembly. In November, 1949, the UN recommended that Libya become an independent and sovereign state not later than Jan. 1, 1952. The United Kingdom of Libya was formally established on Dec. 24, 1951. It was the second country (Israel was the first), created by the United Nations. Sayed Mohammed Idris el Senussi, ruler of Cyrenaica, became King Idris I of Libya (see IDRIS I).

Because of its important location, Libya made military agreements with France, Great Britain, and the United States. The agreement with the French ended in 1954, and restrictions were placed on the British after the Anglo-French attack on Egypt in 1956. The United States operates Wheelus Air Field.

Libya joined the Arab League in 1953 (see ARAB LEAGUE). The country's chief problems are: (1) how to achieve political unity in a country having very different peoples; (2) how to create a modern society with few resources and a conservative, illiterate, poor population; and (3) how to maintain its independence. Libya joined the United Nations in 1955. The United States and Great Britain give Libya military and financial aid. Oil discoveries south of Bengasi in 1958 and 1959 raised hopes for future Libyan prosperity. JAMES S. COLEMAN

See also FLAG (color picture, Flags of Africa); IRRIGATION (picture); MONEY (table).

LIBYAN DESERT is the northeastern part of the Sahara. It includes the ancient Libyan province of Cyrenaica on the west, and extends almost to the Nile River Valley on the east. It slopes up from the Mediterranean Sea almost to Khartoum, in the Sudan. The great level stretches of sandy desert include a few groups of palm-shaded watering places called *oases*. Among these are Baharîya, Dakhla, Farâfra, and Siwa in Egypt, and Kufra in Libya. For location, see LIBYA (map). Several camel-caravan routes cross the desert. The most important runs north-south, connecting Libya with the Sudan and French Equatorial Africa. During World War II, British troops and the German *Afrika Korps* fought back and forth over parts of the Libyan Desert. The British attack at El Alamein was a turning point in the war. JAMES S. COLEMAN

LICE. See LOUSE.

LICENSE means *permission*. The word license is most often used to mean a permit granted by a public authority. Sometimes the granting authority is the federal government. Sometimes it is a state or city government.

A license may permit a person to carry on a business or to practice a profession. It implies that the person who receives the license is capable of doing his work without injuring the public. For example, a doctor must receive a state license before he may legally practice medicine. The license means that the state considers the doctor qualified in his profession.

There are many other kinds of licenses. A man must have a license before he may legally go hunting or fishing. In many states and cities, it is unlawful to own a dog without a license.

Usually a person must pay a certain amount of money for a license. All states require the owner of an automobile to buy a vehicle license. This kind of license has two purposes. It brings funds into the state treasury, and it identifies the vehicle in case of an accident. Many cities also require vehicle licenses, usually in connection with a system of safety tests for automobiles.

License also is used in law to indicate a qualified right to do something. For example, a *licensee* is a person who has a right, generally, to enter a building or to be on land belonging to someone else. If a man rents a building and is allowed to park his car behind it, he is a licensee. JOHN ALAN APPLEMAN

See also DOG (Laws); HUNTING (Game Laws); MARRIAGE (License).

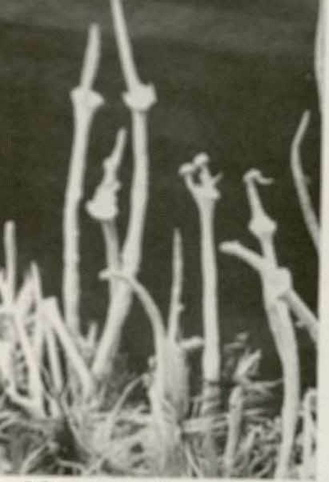
LICENSE TAX. See TAXATION (Kinds); ROADS AND HIGHWAYS (How Roads and Highways Are Paid For).

LICENSING AIRPLANES AND PILOTS. See AVIATION (Government Aid and Control).

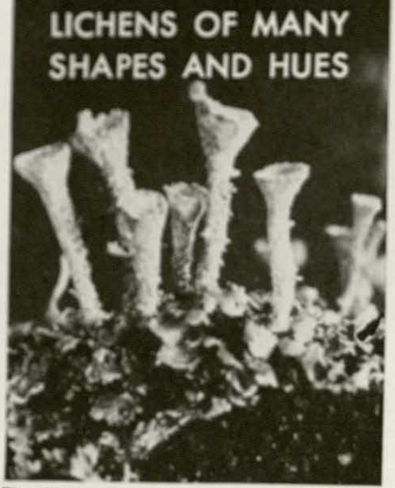
LICHEN, *LIE kuhn*, is a flowerless plant that grows on bare rocks and tree stumps and in waste places throughout the world. Lichens may be found in cold regions, including Antarctica, and in the tropics. They grow on beaches as well as on mountaintops. Scientists know of about 15,000 kinds of lichens. The plants may be gray, yellow, brown, green, blue, or black.

Each lichen consists of an alga and a fungus that live together in a kind of plant partnership. The green alga produces food. The fungus absorbs and stores water. This kind of partnership among organisms is called *symbiosis* (see SYMBIOSIS).

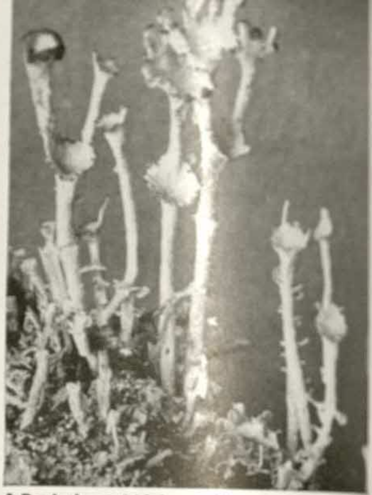
LICHENS OF MANY SHAPES AND HUES



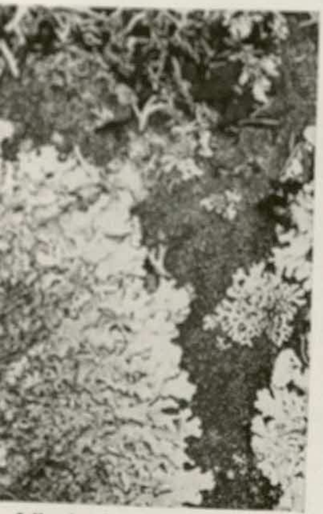
A Branched, Olive-green Lichen found in shady northern forests



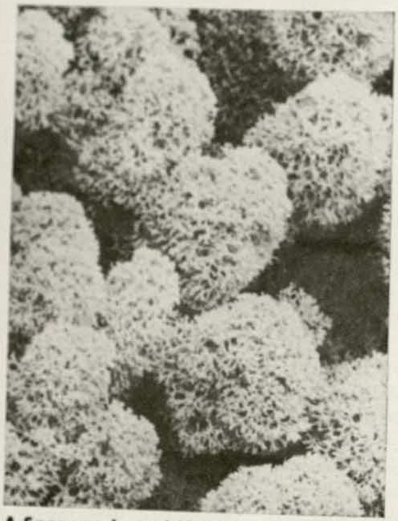
The Mossy-Cup Lichen, which grows in the shape of slender, shallow goblets with a fuzzy surface



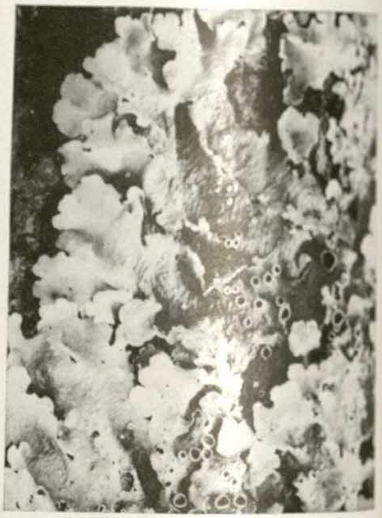
A Red-tipped Lichen with grayish stalks, found in open country



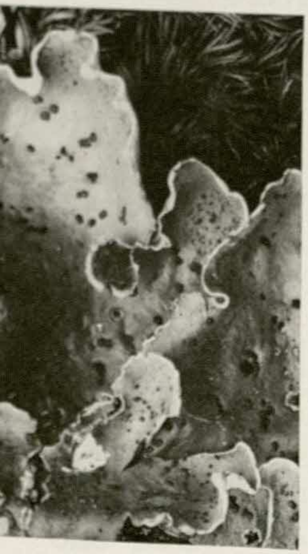
A Hardy, Common Lichen forming flat patches on rocks and trees



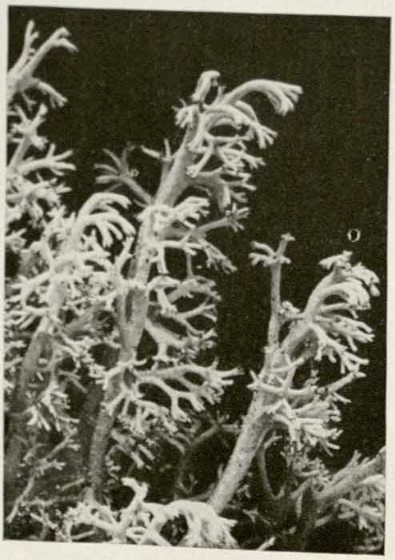
A Sponge-shaped Lichen of sunny places. It is one of the principal foods of reindeer.



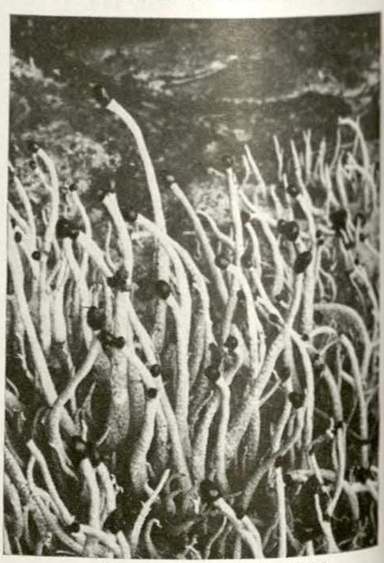
The Flat Lobes and Brown Cups of a lichen living on tree trunks



A Lichen of Damp Shady Ground is bright green above and white below.



A Handsome Lichen common in the Far North. It is one of the kinds known as reindeer moss.



Devereux Butcher; Hugh Spencer

A Slender, Black-tipped Lichen of the Olympic Mountains (Washington)

Lichens have no roots, stems, or leaves. They consist of layers of irregularly shaped extensions called *thalli*. Lichens are often classified according to the type of thalli. *Foliose* lichens resemble leaves. They grow over fence rails and similar structures. *Crustose* lichens resemble shells. They may cover large rocks with delicate patterns of grays and greens. *Fruticose* lichens look like moss or tiny shrubs. They grow on trees or in clusters on barren ground.

Lichens multiply by means of *fragments*, or special structures, that break from the plant. The wind may carry these structures considerable distances. Then they drop to the ground and establish a new lichen plant.

Lichens do not require soil for growth. They often exist where other plants cannot grow. Lichens frequently help form soil. They produce acids that result in a breakdown of rocks. Small particles of rock mixed with decayed lichen may be the start of a soil.

Most lichens contain special substances. Different kinds may be identified by the colors produced when they are treated with standard chemicals. Many lichens contain starch, and serve as valuable food for man and animals. People in Iceland use a lichen called *Iceland moss* to make bread. Reindeer in northern regions eat mainly *reindeer moss*, another lichen. Certain lichens are used in such dyes as commercial litmus. ROLLA M. TRYON

See also ALGAE; FUNGI; ICELAND MOSS; LITMUS; REINDEER MOSS.

LICHWAKE. See WAKE.

LICK OBSERVATORY is a mountaintop observatory operated by the University of California. It was founded by James Lick, an American businessman, who left $700,000 to build an observatory with "a powerful telescope, superior to and more powerful than any telescope yet made." Astronomers chose the Mount Hamilton site, 50 miles southeast of San Francisco, because of the clear atmosphere. Seven telescope domes, offices and workshops, and houses for astronomers and other workers stand on the mountain 4,200 feet above sea level. About 80 persons live in the mountain village there.

The great refracting telescope has a lens 36 inches in diameter, and a tube 57 feet long. When finished in 1888, it ranked as the largest telescope in the world. Only the Yerkes Observatory in Wisconsin has a larger refracting telescope. Edward E. Barnard used this Lick telescope to discover the fifth satellite of Jupiter in 1892. Robert G. Aitken and Sherburne W. Burnham used it to discover and study hundreds of double stars.

In the years since Lick's original gift, Lick Observatory has added other telescopes of various types. Edward Crossley of Great Britain donated a 36-inch reflecting telescope in 1895. James Keeler used this to show the great advantage of the reflecting telescope in photographing stars and nebulae. Since then, large telescopes built in various places have all been reflectors. The largest telescope on Mount Hamilton is a 120-inch reflector, completed in 1959. Only the 200-inch telescope of the Palomar Observatory in southern California is larger. A. E. WHITFORD

See also CAMPBELL, WILLIAM WALLACE.

LICKING RIVER is a stream which rises in southeastern Kentucky and flows northwest for about 80 miles to empty into the Ohio River opposite Cincinnati, Ohio.

LICORICE, *LICK oh riss*, is an herb from which we get a valuable flavoring material. The flavoring comes from its long, sweet roots. The licorice plant is a hardy perennial of the pea family.

Licorice is a native of southern Europe and parts of Asia. Only a little is grown in the United States. More than 40,000,000 pounds of dried licorice root are imported into the United States each year. A wild licorice which has sweet-flavored roots grows in the United States.

Licorice in medicine disguises the flavor of disagreeable drugs, and is contained in some cough medicines. It is used to flavor tobaccos, cigars, and cigarettes, as well as soft drinks, candy, and chewing gum.

The fibers of the root remaining after the licorice is

Lick Observatory Stands 4,200 Feet Above Sea Level on Mount Hamilton in Central California.

William Garnett

extracted also are valuable. They are used in the making of a fire-fighting foam, in boxboard and insulation board, and in other products.

Commercial licorice is yellow. It is made by boiling the roots, and then evaporating the extract.

N. Y. Bot. Garden

Licorice Leaves grow on a long stem. The roots of the licorice plant produce an important flavoring material.

Scientific Classification. Licorice is a member of the pea or pulse family, *Leguminosae*. The licorice plant most valuable commercially is classified as genus *Glycyrrhiza*, species *glabra*. The wild licorice of North America is *G. lepidota*.

Harold Norman Moldenke

LICTOR, *LICK tur*, in ancient Rome, was one of the official attendants of the chief magistrates. It was the lictor's duty to accompany them in public to enforce proper respect and fulfill the magistrates' demands. The more important the magistrate, the more lictors he had with him. A dictator was preceded by 24 lictors, a consul by 12, a propraetor by 6, and a praetor by 2. Each lictor carried an ax tied in a bundle of rods called *fasces*, as a symbol of his office. The lictors also punished Roman citizens who had been condemned.

William Scott Ferguson

See also Fasces.

LIDDELL, ALICE. See Carroll, Lewis.

LIDICE, *LID uh chee*, was a village in Czechoslovakia, about 15 miles northwest of Prague. On June 10, 1942, German soldiers destroyed the village. The people had been accused of hiding the killers of Reinhard Heydrich, a Nazi ruler who was terrorizing Bohemia (see Heydrich, Reinhard). German troops killed the men, sent the women to concentration camps, and put the children in German institutions. Then they destroyed the houses of Lidice by burning and shellfire.

After World War II, the United Nations Commission for the Investigation of War Crimes tried and sentenced those Germans responsible for this massacre. The site of Lidice has been preserved so that men would remember the atrocity. Other towns renamed themselves Lidice to honor the destroyed village.

Stefan T. Possony

LIDO. See Venice (Location and Description).

LIE, *lee*, **TRYGVE,** *TRUG vuh* (1896-   ), a Norwegian statesman, served as the first Secretary-General of the United Nations. He was elected for five years in 1946, and was continued in office for three years in 1950. He announced his resignation in 1952, and left office in April, 1953. Russia opposed Lie because he supported the UN's action in South Korea. Lie resigned hoping to lessen international tensions.

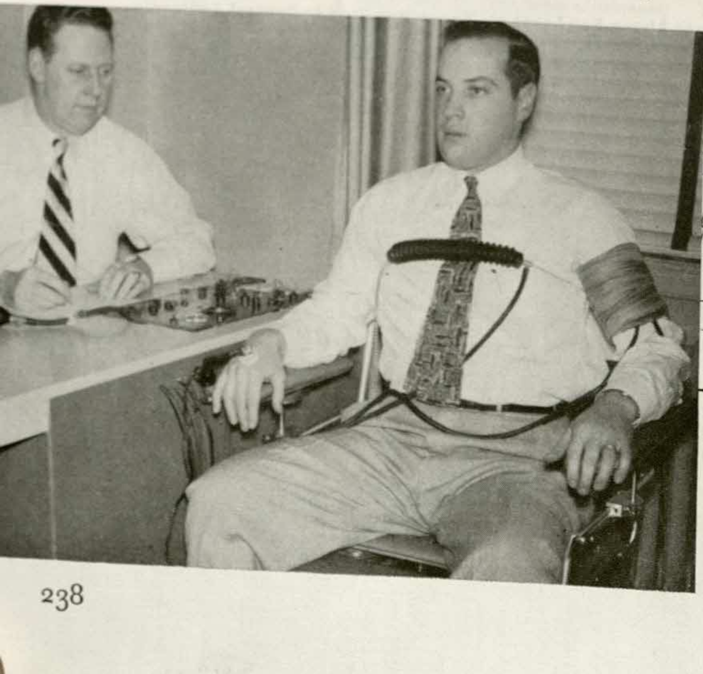
Lie brought both experience and talent in handling political problems to his position in the United Nations. Born in Oslo, Norway, he studied law at the University of Oslo. He then served as legal counsel to the Norwegian Federation of Labor. When the Labor party came to power in 1935, Lie became minister of justice. From then until 1946, he held posts as minister of justice, of commerce, and of foreign affairs.

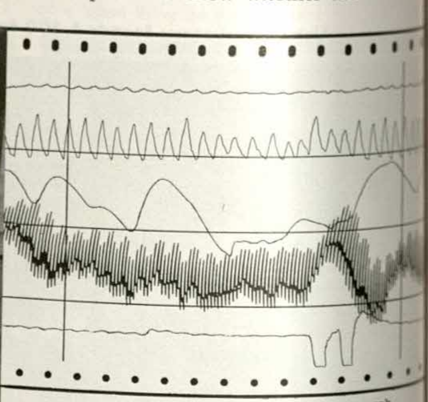
As minister of commerce during World War II, Lie helped manage supplies and shipping for the small Norwegian forces that fought Nazi Germany. In 1941, he became foreign minister and in 1945 headed the Norwegian delegation to the United Nations Conference in San Francisco. At this conference, he led the committee which drew up the charter for the United Nations Security Council.

Raymond E. Lindgren

See also United Nations (picture).

LIE-DETECTOR, or **POLYGRAPH,** is a device used to determine whether a person is telling the truth. The instrument makes a set of ink tracings of changes in a person's blood pressure, pulse, breathing, and certain other bodily activities while he is being questioned. The tracings can be interpreted to show whether the sub-





Fred E. Inbau; The Reid Polygraph

The Lie-Detector is often used by police to find out whether a person is telling the truth. The instrument makes a set of ink tracings that record body activities while a person is being questioned. The tracings show, *top to bottom*, arm movements, breathing pattern, skin resistance, blood pressure and pulse rate, and thigh movements.

ject's answers during the test have been lies or the truth. One such instrument, the *Reid Polygraph*, records changes in blood pressure, pulse, and breathing. It also records muscular movements and pressures in the arms and legs, and galvanic reflexes, or electrical changes, in the skin of the hands.

No one can be forced to take a lie-detector test. The person who agrees to submit to a test sits in a chair with a blood-pressure and pulse cuff on his arm, a respiration tube around his chest, and galvanic reflex electrodes on the palm of his hand. The chair itself has devices that detect muscular pressures and movements, as shown in the accompanying picture.

A moving chart provides a continuous recording of these various bodily activities during the period of test questioning. Usually nine questions are asked. Only two or three will be about the actual case under discussion. The other questions are simple, unimportant ones, asked for control purposes.

Ordinarily, a person who answers a question falsely shows an increase in blood pressure, or holds his breath. He usually will not show these signs when he answers questions truthfully. The lie detector traces these and other changes, but the others are generally not so reliable as blood pressure and breathing.

An innocent person may be so nervous that he shows disturbances in the tracings, but his nervousness will continue throughout the test record. He will be no more nervous on the key questions than on the others.

The lie-detector technique has a high degree of accuracy when used by a competent and experienced examiner. Although the test results cannot as yet be used as legal evidence in court trials, the technique is a valuable aid to the police in determining whether persons are lying or telling the truth.

John A. Larson made one of the first polygraphs in 1921. Leonarde Keeler introduced an improved lie detector in 1926. John E. Reid developed a polygraph in 1945 which recorded not only blood-pressure, pulse, respiration, and skin reflexes, but also muscular pressures and changes.

FRED E. INBAU

LIEBIG, *LEE bick,* **BARON VON** (1803-1873), JUSTUS VON LIEBIG, helped found *organic chemistry*, the study of compounds that contain carbon. He made many discoveries in this field and improved the methods of organic analysis. His most important experiments involved the chemistry of the soil. He worked to develop fertilizers, and his book, *Chemistry of Food*, led to increased knowledge on how to prepare food. Liebig also was one of three discoverers of chloroform. The Liebig condenser, an apparatus used in distilling liquids, was named for him.

Liebig was born in Darmstadt, Germany, and studied chemistry in Paris. He later directed one of the world's most famous chemical laboratories, at the University of Giessen.

K. L. KAUFMAN

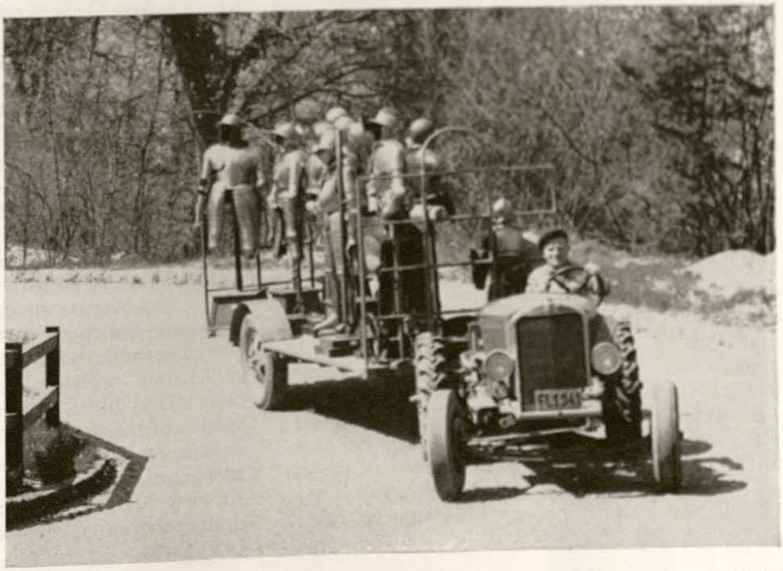
LIECHTENSTEIN, *LIHK ten shtine*, is the fourth smallest country in the world. It covers 61 square miles, making it eight square miles smaller than the District of Columbia. The *map* shows that Liechtenstein lies between Austria and Switzerland in the valley of the upper Rhine River. It is mountainous except in the west where Vaduz, its capital and chief city, lies.

Liechtenstein is a principality. Its prince belongs to the Liechtenstein family that acquired the territory between 1699 and 1712. Liechtenstein has won fame for its finely engraved postage stamps, many of which are reproductions of paintings belonging to the ruling family. Collectors all over the world who buy the stamps provide Liechtenstein with a major portion of its income. An additional source of revenue is an annual contribution of about $100,000 from the prince. Extremely low income and business taxes cause thousands of international companies to register there.

Most of the people make their living from farming (livestock, grains, fruits); cotton weaving; the production of machines and tools; and the manufacture of clay and leather goods.

Liechtenstein, which has a population of 13,571, has several towns. The largest are Vaduz (pop. 2,735),

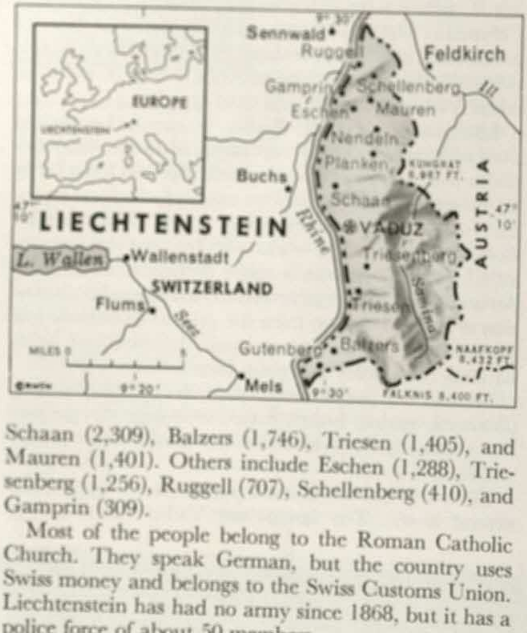
Dita Herein



An Armor Collection in Liechtenstein is sent out from the museum for cleaning once each year.

The Castle Liechtenstein stands on a mountainside overlooking the capital of Liechtenstein, Vaduz. The Prince of Liechtenstein lives in the historic castle. The Swiss Alps tower in the background.

Ewing Galloway



Schaan (2,309), Balzers (1,746), Triesen (1,405), and Mauren (1,401). Others include Eschen (1,288), Triesenberg (1,256), Ruggell (707), Schellenberg (410), and Gamprin (309).

Most of the people belong to the Roman Catholic Church. They speak German, but the country uses Swiss money and belongs to the Swiss Customs Union. Liechtenstein has had no army since 1868, but it has a police force of about 50 members.

All adults may vote, and laws are made by a 15-member diet. A special act of the diet is needed to make an immigrant a naturalized citizen. George Kish

See also Flag (color picture, Flags of Europe); Money (table); Vaduz.

LIÈGE, *lyehzh* (pop. 155,670; met. area, 550,000; alt. 320 ft.), lies on both banks of the Meuse River about 54 miles southeast of Brussels, Belgium. See Belgium (color map). It has many iron and steel factories, zinc smelters, and glassworks that work closely with nearby mines. The city has long been famous for the manufacture of guns. Liège is an attractive city, with fine buildings and a university that was founded in 1817. It is a leading cultural center of Belgium.

A ring of 12 forts on the hills around Liège has played an important part in the historic defenses of the city. Opposing armies fought bitterly for control of Liège in World Wars I and II because of its strategic location and its products. Daniel H. Thomas

LIEN, *leen*, in law, is the claim or legal hold of one person upon the property of another as security for debt. Liens are of two kinds, *specific* and *general*. Under a specific lien, a person may retain possession of goods until his claim is satisfied. A specific lien also may be held against any piece of real or personal property for a debt that grows out of materials furnished or work done upon it. This is the most common form of lien. A general lien is held against property, usually for labor or materials furnished. William Tucker Dean

See also Mechanic's Lien.

LIEPĀJA, *LYEH pah yah* (pop. 71,000; alt. 10 ft.), is a Baltic seaport in Latvia. For location, see Latvia (map). Its harbor is free of ice all year. Liepāja is now a Russian naval base. It has the largest metalworking factory in Latvia, and factories that produce linseed oil, linoleum, and cork. Liepāja had medieval buildings until after World War II, when the old section was rebuilt to look like a Russian town. Francis J. Bowman

LIEUTENANT. See Rank in Armed Services.

LIEUTENANT COLONEL. See Rank in Armed Services.

LIEUTENANT COMMANDER. See Rank in Armed Services.

LIEUTENANT GENERAL. See Rank in Armed Services.

LIEUTENANT GOVERNOR ranks second to the governor in most states of the United States. His position resembles that of the Vice-President. He is elected at the same time as the governor, and for the same term. He presides over the state senate in 37 of the 39 states that have lieutenant governors. In this position, his powers resemble those of the speaker in the lower house of the state legislature. In a few states he may have other official duties, such as serving on a board or commission of the state government. The lieutenant governor serves as governor if the governor dies, resigns, is impeached, or becomes unable to carry out his duties. In some states, he exercises the powers of governor during the governor's temporary absence. See also Governor. David Fellman

Chicago Sun-Times; U.S. Forest Service

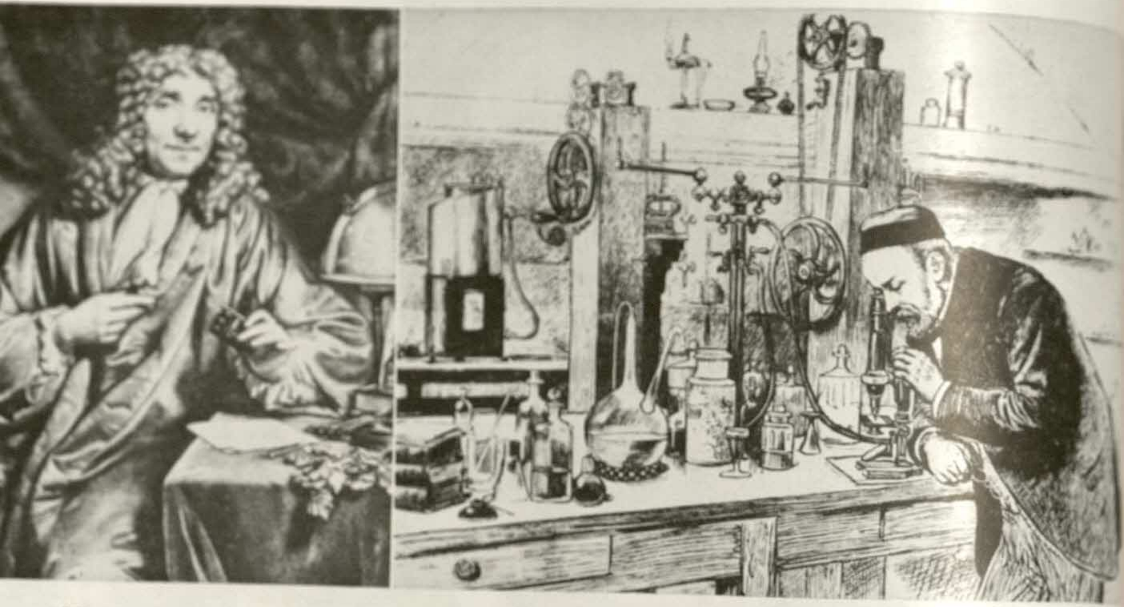
Life Takes Many Forms. It is evident in the squirming of a newborn baby. It is shown in the tremendous growth of the centuries-old sequoia, one of the oldest living things.

LIFE is one of the great mysteries of the universe. It has no simple definition. We can easily recognize most things as either living or nonliving. We know that a rabbit is alive, but a rock is not. We identify living things by certain activities that nonliving things do not perform. For example, living things grow, reproduce themselves, and require food. Living things also differ from nonliving things in the way the substances that compose them are put together.

Philosophers and other scholars have pondered the meaning of life since ancient times. With the dawn of science, men began to study the different kinds of *organisms*, or living things. They learned how organisms grow, what conditions they need to live, how they respond to their surroundings, and how they reproduce. They classified living things as either *plants* or *animals*. Scientists have built a tremendous storehouse of knowledge about living things. But they still cannot say what life itself actually is.

The Chemical Basis of Life

Living things are composed of the same basic chemical *elements* as nonliving things. When chemists analyze the composition of organisms, they find elements that occur commonly in the earth, in sea water, and in the air. The most common elements found in living things are carbon, hydrogen, oxygen, nitrogen, sulfur, phos-



Bettmann Archive

Scientists Have Studied Life for hundreds of years. About 1700, Anton van Leeuwenhoek of The Netherlands, *left,* became the first man to see microscopic forms of life. In the 1800's, Louis Pasteur, *right,* proved organisms do not come alive by "spontaneous generation."

phorus, potassium, calcium, iron, and magnesium. Small amounts of other elements are also present, including sodium, chlorine, manganese, copper, iodine, and fluorine.

Elements found in living things usually have combined to form *compounds*. Water, a compound of hydrogen and oxygen, accounts for between 65 and 90 per cent of the weight of most plants and animals. Compounds found in living things may be organic or inorganic. *Inorganic* compounds are all relatively simple. A few of them contain carbon. Inorganic compounds also exist in nonliving matter. *Organic* compounds are found naturally only in living things or their products. These compounds always contain carbon. Chemists have learned to make many organic compounds.

The organic compounds in living things include carbohydrates, fats, and proteins. All these contain carbon, hydrogen, and oxygen. Proteins also contain nitrogen, and often sulfur and other elements. See ELEMENT, CHEMICAL; COMPOUND.

Carbohydrates and Fats provide sources of energy for living things. Carbohydrates, such as starches and sugars, are produced by green plants from inorganic compounds. Animals must get carbohydrates by eating plants or other animals that eat plants. The carbohydrates may be broken down to release energy, or they may be stored for future energy. Or the organism may use them as part of its supporting structures. For example, wood is a supporting structure in trees. It consists mainly of carbohydrates.

Fats and oils are used mostly as stored energy. They release more than twice as much energy for their weight as do carbohydrates. See CARBOHYDRATE; FAT.

Proteins are basic to all life. Living things may use them to provide energy, or as chemical building blocks for growth and development.

The large, complex protein molecules may each contain as many as a million atoms. The proteins are chains of smaller molecules, called *amino acids*. Scientists have identified more than two dozen different amino acids present in various proteins. A single protein molecule may contain several thousand amino acid units. But most proteins contain only a few of the many different amino acids. Variations in the total number of the various amino acids present, and in the order of the amino acids in the chain, provide a huge number of different proteins. See AMINO ACID; ATOM; MOLECULE.

Chemists have identified the parts of some proteins. But they have not been able to *synthesize*, or make, the proteins in the laboratory. However, they can synthesize shorter chains of amino acids, called *polypeptides*.

Proteins are closely related to the activities that characterize life. Their structure and properties may change as the activities of life take place.

Proteins also tend to be characteristic of only one kind of organism. That is, each of the many kinds of organisms is made up of slightly different proteins. The differences among living things are somehow related to the differences in their proteins. See PROTEIN.

The Structure of Living Things

Protoplasm is the substance that makes up all living things. It is a complex mixture of many different materials, including proteins, water, fats, carbohydrates, and certain minerals. Many characteristics of life result from the properties of protoplasm. For example, most protoplasm is destroyed at temperatures near the boiling point of water, 212°F. at sea level. Therefore, only a few kinds of organisms can survive at temperatures above this point.

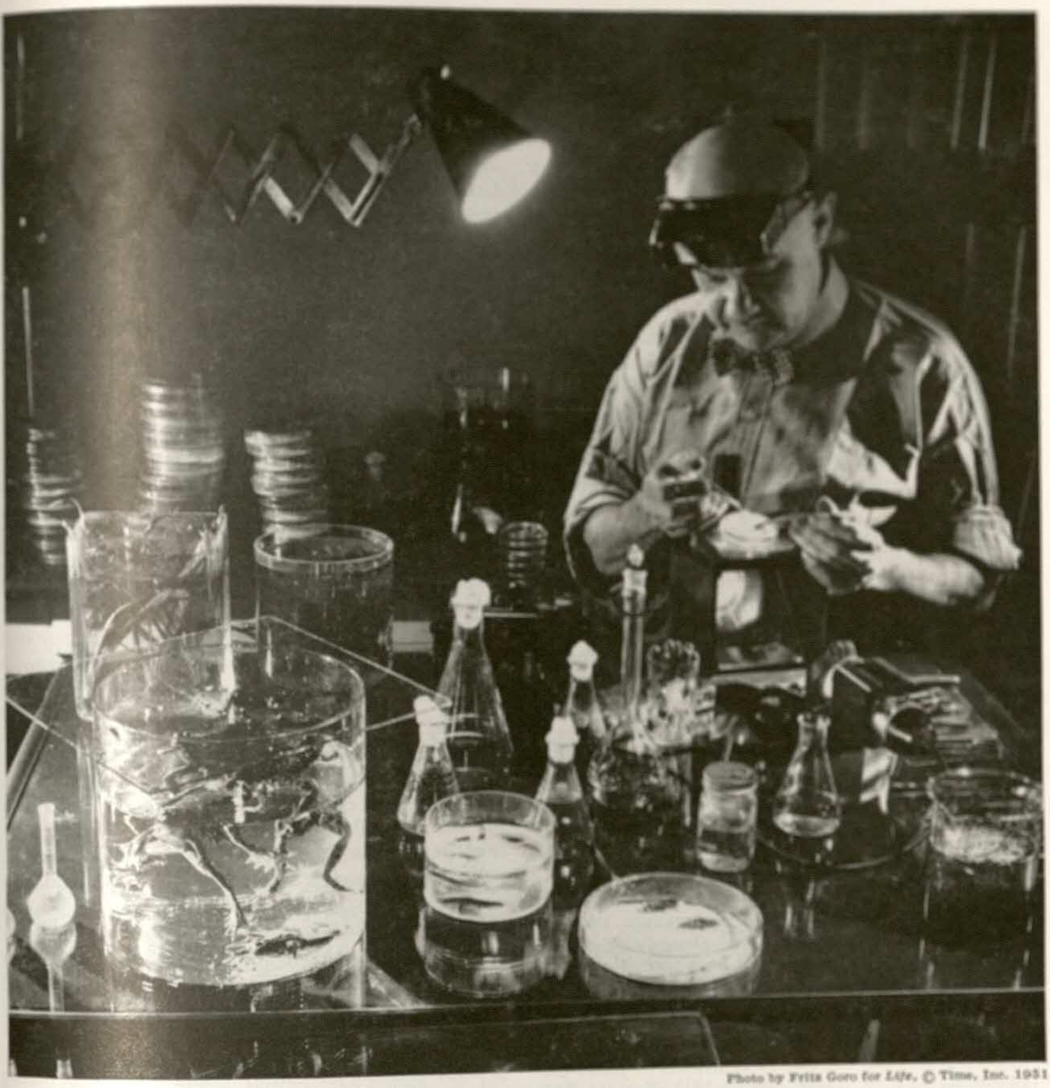


Photo by Fritz Goro for *Life*. © Time, Inc. 1951

Present-Day Biologists Study Living Things with the Aid of Many Different Scientific Instruments.

Scientists have not completely analyzed protoplasm. They know the basic elements that compose it. But attempts to analyze the substance destroy the organization of its components. When this organization breaks down, the protoplasm is no longer a living substance. See PROTOPLASM.

Cells. Protoplasm is organized into units called cells. The cell is the basic unit of life. Some plants and animals, including algae and protozoa, are one-celled organisms. The single cell performs all the life processes. In some organisms, small numbers of cells group together to form *colonies*. All the cells in a colony are alike in many cases. Each cell performs all the activities of life.

Most plants and animals consist of many kinds of cells, each of which has special functions. The combined functions make up the life activities of the organism. For example, the single cell of a protozoan is both sensitive to light and able to digest food. In a many-celled animal, such as a cat, certain cells in the eye are sensitive to light, and cells in the stomach and intestine produce *digestive enzymes*, or substances that digest food. The eye cells do not produce digestive enzymes, and the stomach and intestinal cells are not sensitive to light.

The cells of plants differ in some ways from those of animals. But the basic structure of all cells is the same. The protoplasm in cells has two distinct parts, the nucleus and the cytoplasm. The *nucleus* contains the factors that control heredity. It also appears to regulate the growth and reproduction of the cell and to govern most of the cell's activities. The *cytoplasm* makes up the rest of the cell. It performs many of the chemical activities of life. The cytoplasm contains various structures or specialized regions, related to the cell's activities. See CELL.

Tissues, Organs, and Organ Systems. In higher organisms, cells of similar structure and function are grouped into *tissues*. Some kinds of tissues protect the organism from its environment. Others carry out special chemical reactions or produce special materials.

Tissues may be grouped into structures called *organs*. Different kinds of tissues work together to perform the functions of an organ. For example, muscle tissue and nerve tissue work together to keep the heart working efficiently.

In most animals, organs are grouped into *systems*. A system may be composed of many different organs, each of which performs a particular part of a general function. For example, the digestive system of a mammal includes the mouth, esophagus, stomach, intestines, and associated glands. Each organ plays a part in the intake or digestion of food. See TISSUE; HUMAN BODY (Systems).

The Activities of Life

The basic activities of life include growth, nutrition, reproduction, responsiveness, and movement. These activities are also found in nonliving things. For example, the blades of a windmill spin, and water turns to ice in response to a particular temperature. But a living organism performs all the activities of life at one time or another, and no nonliving thing can perform them all. In addition, the activities of organisms are more complex than those of nonliving things.

Growth and Nutrition. In organisms, growth means more than an increase in size. An organism may grow by increasing the number of its cells by cell division, or by increasing the size of its cells. Growth may be the development of certain parts of the organism, or it may be *regeneration*, or replacement of a lost part.

Growth results from an increase in the amount of protoplasm of the organism. The organism takes in *nutrients*, or food substances, and changes them into energy or into building blocks for growth and repair. The organism can change food substances into its own living substance—that is, the special kinds of proteins and other molecules in its protoplasm.

Green plants use the energy of the sun to make carbohydrates out of water and carbon dioxide. This process is called *photosynthesis* (see PHOTOSYNTHESIS). It provides most of the energy available to living things. Plants store energy in carbohydrates. They can also change carbohydrates into substances used for growth. Animals get energy and growth substances by eating green plants or by eating other animals, which have eaten green plants.

Plant and animal cells release energy from nutrients by *cellular respiration* and other processes. The cells use this energy for their life activities. The organism's *metabolism* includes all the processes by which it changes food into living tissue and into energy. See GROWTH; METABOLISM; NUTRITION; RESPIRATION (Cellular Respiration).

Reproduction is the process by which living things produce more of their own kind. It varies from mere *cell division* among the simplest plants and animals to *sexual reproduction* in human beings and most higher forms of plant and animal life. Reproduction may result in offspring with certain minor variations, such as a tougher root of a tree or a longer tail of a fish. Over many generations, these variations help *species* (groups) of organisms *adapt*, or become adjusted, to changes in their living conditions. See EVOLUTION; HEREDITY; REPRODUCTION.

Irritability is the ability to respond to stimuli, such as light or heat. It is a characteristic of all living organisms. In order to adjust to their surroundings, organisms must respond to such stimuli as light, temperature, and pressure, or touch. All cells have some capacity for irritability. In many multicelled animals, certain cells respond to stimuli and others transmit these responses (see NERVOUS SYSTEM). Even plants have irritability. For example, the leaves of a sensitive plant close rapidly when touched. Green plants respond to light by growing toward it.

Movement. Most living things are capable of some kind of movement. Fish swim. Turtles crawl. Birds fly. Men walk or run. Plants may seem to be motionless, but their growth is a slow kind of motion. The protoplasm within living cells is always moving. This movement gets its energy from inside the organism. Nonliving things may also move. But a stone rolling downhill or water plunging over a cliff moves because of outside forces, such as gravity.

Conditions for Life

Life can exist only under certain conditions. For example, all living things must be able to get certain chemical elements and compounds for nutrition and cellular respiration. Light from the sun furnishes energy for photosynthesis.

The range of conditions suitable for life exists near the surface of the earth in a thin region called the *biosphere* (see BIOSPHERE). No animals are known to live more than 23,000 feet below sea level. Some birds live as high as 27,000 feet above sea level.

Temperature of the universe ranges from −460° F., or absolute zero, to at least 36,000,000° F., the temperature at the center of the sun. But most living things can exist only within a temperature range of about 100 degrees. In general, life processes cease near the freezing point of water, 32° F., and at about 176° F. A few kinds of plants and animals can withstand exposure to higher temperatures, but most organisms will not grow or develop except within a fairly narrow range. Many organisms live through long periods of low temperatures, but their life activities are greatly reduced at these times. See TEMPERATURE.

Required Substances include oxygen, hydrogen, carbon, and nitrogen. Most organisms must have oxygen from the air or dissolved in water for the processes of cellular respiration. Green plants need carbon dioxide for photosynthesis. Organisms also require water, which makes up a large part of all protoplasm. Water is involved in many of the chemical reactions that take place within living things. In addition, every kind of organism needs certain special chemical elements and compounds. For example, man requires such compounds as niacin and ascorbic acid, or vitamin C.

Adaptability. Living things must adapt to many factors and changes in their environments. For example, animals must be able to find and use the food supply available. If they cannot, they will starve. Plants must withstand extremes of climate, such as high or low tem-

LENGTH OF LIFE OF ANIMALS

Figures in this list are from animals in captivity, because of the difficulty of determining the ages of wild animals.

MAMMALS

(Average Life Span in Years)

Buffalo	10	Jaguar	14
Cat	13-17	Lion	20-25
Chimpanzee	15-20	Monkey (rhesus)	15
Deer (fallow)	10	Mouse	1-2
Dog	13	Sheep	10-15
Elephant	60	Squirrel	9
Goat	10	Tiger	11
Grizzly Bear	20	Wolf	12
Hippopotamus	40	Zebra	22
Horse	20-30		

FISH

(Maximum Life Span in Years)

Dogfish	2	Mackerel (Pacific)	11
Electric Eel	11½	Perch	11
Flounder	10	Pike	24
Goldfish	25	Seahorse	6
Halibut	40	Sole (Dover)	15
Lamprey	5	Sturgeon	50
Lungfish (African)	17	Trout (rainbow)	4

BIRDS

(Maximum Life Span in Years)

Blue Jay	4	Owl (snowy)	24½
Canada Goose	32	Penguin (king)	26
Canary	24	Pigeon	35
Cardinal	22	Raven	69
Chickadee	7	Robin	12
Condor	52	Skylark	24
Heron	24	Sparrow	20
Macaw (red and blue)	64	Starling	15
Ostrich (African)	50		

REPTILES AND AMPHIBIANS

(Maximum Life Span in Years)

Alligator	56	Gila Monster	20
Boa Constrictor	23	King Snake	14½
Bullfrog	15½	Puff Adder	14
Chameleon	3½	Rattlesnake	18½
Cottonmouth	21	Turtle (box)	123
Crocodile	13½	Salamander (spotted)	25
Frog (leopard)	6	Water Snake	7
Garter Snake	6		

peratures and little or plentiful rainfall. The environment of any organism includes many other organisms, both similar to and different from itself. Every living thing must be able to get food and to escape its foes, or it will die. Organisms that cannot adapt to the various environmental changes taking place each day, each season, or over a lifetime, cannot live. See ECOLOGY; ENVIRONMENT.

Length of Life

The potential length of life of all living things is determined primarily by heredity. May flies and some other insects survive as adults for only a few hours, because they cannot eat. But the giant redwood trees of the Pacific Coast of the United States live for thousands of years.

Organisms vary greatly in their development patterns, or the ways in which they grow and mature. Often, the development pattern determines the life span. For example, many kinds of plants grow to maturity, flower, bear seeds, and die within a short period. Mature insects may survive only a short time, but the immature larval and pupal stages may live for many months, or even years.

Animals. Scientists find it difficult to determine the life spans of many kinds of animals. The table with this article includes recognized life spans for several animals.

Man. Few persons live more than 100 years. Since 1900, the average length of life for the population of the United States has increased by more than 20 years. A baby born in 1900 had a life expectancy of 47.3 years. A baby born in 1956 had a life expectancy of 69.6 years (see DISEASES OF CHILDREN). In Canada, life expectancy for men increased from 60 years in 1931 to 66.3 years in 1951. For women, the increase was from 62.1 years to 70.8 years. The percentage of old people in the population today is greater than ever before. Medical scientists study the problems of the aged in a branch of medicine called *geriatrics* (see GERIATRICS).

The life table in this article uses 100,000 babies born alive as a basis for calculation. Of these 100,000 babies, 2,609 died before reaching one year of age. Great as this figure seems, the deaths of infants in the past were even greater in proportion. The decrease of infant mortality has been a main factor in the average increased length of life. See VITAL STATISTICS.

LIFE EXPECTANCY IN THE UNITED STATES

AGE INTERVAL	NUMBER LIVING*	EXPECTATION OF LIFE**				
		All Races	White Male	White Female	Nonwhite Male	Nonwhite Female
0-1	100,000	69.6	67.3	73.7	61.1	65.9
1-5	97,391	70.4	68.2	74.2	63.1	67.4
5-10	96,969	66.7	64.4	70.5	59.6	63.9
10-15	96,743	61.9	59.6	65.6	54.8	59.1
15-20	96,514	57.0	54.8	60.7	50.0	54.2
20-25	96,055	52.3	50.1	55.9	45.4	49.4
25-30	95,419	47.6	45.5	51.1	41.0	44.8
30-35	94,793	42.9	40.9	46.2	36.7	40.3
35-40	94,005	38.3	36.2	41.4	32.5	35.9
40-45	92,896	33.7	31.6	36.7	28.5	31.8
45-50	91,190	29.3	27.3	32.1	24.6	27.8
50-55	88,520	25.1	23.1	27.7	21.1	24.1
55-60	84,560	21.1	19.3	23.4	17.8	20.7
60-65	78,788	17.5	15.9	19.3	15.2	17.9
65-70	70,722	14.2	12.9	15.5	12.9	15.3
70-75	59,655	11.3	10.3	12.2	11.5	13.6
75-80	46,746	8.7	7.9	9.2	10.2	11.9
80-85	32,277	6.5	6.0	6.6	8.7	9.9
85 and over	17,372	5.0	4.7	4.9	8.0	8.7

*Of 100,000 born alive, number living at beginning of age interval.
**Average number of years of life remaining at beginning of age interval.
Source: Public Health Service, U.S. Dept. of Health, Education, and Welfare.

The Origin of Life

The Bible Story of Creation is given in the first chapter of Genesis, the first book of the Old Testament. There it is recorded how God created light; divided night and day; made the heavens, the water and land, plants, and trees; created the sun, moon, and stars; made the fishes, birds, and whales; created land animals and Adam, the first man. Then He rested.

Many people believe this to be the story of a single week, with God resting on Sunday. Others give a broader interpretation. Almost all religions teach that all forms of life were created by some divine or supernatural being or force.

Early Theories. In ancient and medieval times, many persons believed that living things could arise from nonliving matter. For example, some thought that maggots developed from decaying meat. This development of life from nonliving substances was called spontaneous generation (see SPONTANEOUS GENERATION).

During the 1600's, the Italian scientist Francesco Redi cast doubt on the idea of spontaneous generation. He showed that meat placed under a screen and protected from flies did not produce maggots. In the 1700's, the Italian abbé Lazzaro Spallanzani showed that not even microscopic organisms could develop in a broth that was sealed off from the air and boiled. Spallanzani boiled the sealed flask of broth to *sterilize* it. This killed any organisms that might have been in the flask or in the broth before it was sealed. The seal prevented any organisms from entering during the experiment. No living things developed in the sterile broth.

John Needham of England thought that the boiling somehow changed the properties of the broth and of the air in the flask, and made them unable to support life. Spallanzani then broke the seal on the flask and let in fresh air. Many organisms appeared in the flask and grew successfully. But Spallanzani could not find a way to show that boiling had not altered the properties of the air in the sealed flask.

The controversy continued until 1860, when Louis Pasteur of France modified Spallanzani's experiment. Instead of sealing a flask of broth, Pasteur drew the flask's neck into a long, S-shaped curve. Fresh air continually entered the flask. But the heavy particles of dust, bacteria, and mold in the air were trapped in the curve of the neck before they could reach the broth. Then Pasteur boiled the flask of broth. No microorganisms appeared in the flask. This work showed that microorganisms do not appear on sterile material, or material that has no living things on it. They arise only when matter is contaminated by spores or other forms of living things (see SPORE).

After Pasteur's experiments, most scientists believed that spontaneous generation of life from nonlife is impossible under any circumstances. They stated that all life must come from other life. This is why the question of how life *first* appeared was for many years so difficult for scientists to answer.

Later Theories. One theory states that life originally came to earth from outer space. It says that spores and other dormant stages of microorganisms wandered about through space and finally landed on the earth and began to grow and develop. But many scientists do not accept this theory because of the hazards the spores would meet in space.

Most biologists and biochemists believe that life developed from nonliving material. They believe that this took place at an early stage of the earth's history. These scientists state that Pasteur's experiments show only that organisms that we recognize as living things do not arise from nonliving matter under conditions present on earth today. But, billions of years ago, conditions on earth were quite different. The atmosphere surrounding the earth was composed of different gases from those of today. And no organisms existed to eat the developing substances before they could become "life."

Many scientists believe that life evolved through a complicated series of chemical reactions, beginning with simple compounds of carbon. They believe that life began in the oceans and lakes, which held many kinds of chemicals in solution. The energy from the sun, and billions of years of time, brought the formation of complex organic molecules, such as amino acids.

Before the rise of what we would recognize as life, the complex organic molecules probably joined together to form still larger molecules. Scientists believe that the first living organisms were probably somewhat like viruses. That is, they were not much more than a group of complex organic molecules. These organisms lived in an environment that was rich in all kinds of organic compounds. They probably lived by "eating" these compounds as foods. Eventually, some organisms became able to use simpler, more easily available inorganic compounds to produce energy.

Certain developments tend to support this theory. The existence of viruses shows that organisms consisting only of a group of complex molecules can live. Experiments by chemists have shown that amino acids will form in a mixture of the gases that scientists believe made up the atmosphere when life began. This reaction takes place when energy in the form of electrical discharge is added to the gases.

W. GORDON WHALEY

Related Articles in WORLD BOOK include:

Biology
Botany
Environment
Growth
Metabolism
Nutrition
Protoplasm
Zoology

Outline

I. The Chemical Basis of Life
  A. Carbohydrates and Fats
  B. Proteins
II. The Structure of Living Things
  A. Protoplasm
  B. Cells
  C. Tissues, Organs, and Organ Systems
III. The Activities of Life
  A. Growth and Nutrition
  B. Reproduction
  C. Irritability
  D. Movement
IV. Conditions for Life
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  C. Adaptability
V. Length of Life
  A. Animals
  B. Man
VI. The Origin of Life
  A. The Bible Story of Creation
  B. Early Theories
  C. Later Theories

Questions

What are the basic activities of life?

What are the most important substances found in living things?

What is protoplasm? What basic elements make it up?

Why is photosynthesis important to all organisms?

In what temperature range do most living things exist?

How do the functions of a cell in a one-celled animal differ from those in many-celled animals?

What kinds of adaptations must organisms make to their environments?

What are the kinds of organic compounds in living things?

How do green plants make carbohydrates?

Where do many scientists believe life began?

LIFE AND ADVENT UNION. See Adventists.

LIFE BUOY. See Breeches Buoy; Life Jacket.

LIFE CYCLE is the sequence of forms and activities that a living thing passes through from a particular stage in one generation to the same stage in the next. Growth and reproduction always take place. The life cycle of mammals is relatively simple. They develop from a fertilized egg to an adult by growth. The adults produce *gametes*, or sex cells. Fertilization of the egg begins development of a new individual. Many lower organisms have even simpler life cycles. But most plants and some animals go through complex life cycles, involving more than one individual. In many, a generation of sexual reproduction follows one of asexual reproduction. The sequence of events in the life of a single individual is called the *life history*. See also Life; Metamorphosis; Reproduction. Clair L. Worley

LIFE INSURANCE. See Insurance (Life).

LIFE JACKET, or **LIFE VEST,** helps protect the lives of persons who work on or close to open water. Most life jackets are filled with a light material, such as cork or kapok, which will help to keep the person afloat. They are covered with durable cloth, usually waterproofed. Often the cloth is dyed a bright color such as orange to make it easily visible. Most life jackets have no sleeves, so the wearer's arms can move freely. Several life jackets were invented in the 1800's, but soldiers had used inflated animal skins in the water as early as the 800's B.C. American armed forces began using inflatable "Mae West" jackets, made of rubber, during World War II. The jackets were designed to be light, and thin enough not to be in the wearer's way. But they can be inflated quickly and easily from a small bottle of compressed air built into the jacket.

LIFE PRESERVER. See Breeches Buoy; Life Jacket.

LIFE ZONE is a region that generally has the same type of plant and animal life, and the same type of climate. Because of environment, the plants in one life zone usually differ from the plants in another zone. The animals in a particular zone need the type of plants that grow there. For this reason, these animals also tend to form different groups in different zones. The location of a life zone depends on both latitude and altitude. A rise in altitude of 1,000 feet is equal to traveling about 200 miles closer to the North Pole. See also Ecology (Life Zones). Richard M. Pearl

LIFEBOAT. See Coast Guard, United States (Ships).

LIFESAVING. See Coast Guard, United States (What the Coast Guard Does); Dog (How Dogs Help Man); Drowning; First Aid; Safety; Swimming (picture).

LIFFEY, *LIF ih*, **RIVER** is a waterway used by small ships in eastern Ireland. The Liffey rises in the mountains of Wicklow and flows northeastward for 50 miles. It flows through Dublin and empties into Dublin Bay.

LIFT. See Aerodynamics (Lift).

LIFT PUMP is a pump which raises water or some other liquid and ejects it. The pumps which farmers often place on their wells are lift pumps. See also Pump.

LIGAMENT is fibrous tissue gathered together as cords, bands, or sheets. Ligaments hold organs in place or fasten bones together. They are as strong as rope. A *sprain* is an injury to ligaments caused by tearing or twisting forces across a joint. A sprained ankle is an incomplete tearing of the *talofibular* ligament that joins the bones of the foot with the leg. Ligaments heal slowly, and sometimes not at all if they are torn completely apart. Doctors use adhesive straps, elastic bandage, or plaster casts to limit movement. This encourages a ligament to heal securely. Marshall R. Urist

LIGAN. See Flotsam, Jetsam, and Lagan.

LIGATURE is a thread used in surgery to tie a bleeding blood vessel. Surgeons did not use ligatures extensively until germfree surgery developed in the mid-1800's. Before that time, ligatures almost always caused infection. The British surgeon Joseph Lister devised a sterile ligature, called *catgut*, from a sheep's bowel. The body absorbs this material without harm. Because of the freedom from bacteria in modern surgery, surgeons may also use silk, cotton, linen, and nylon ligatures. These are not absorbed, but are not harmful. Michael L. Mason

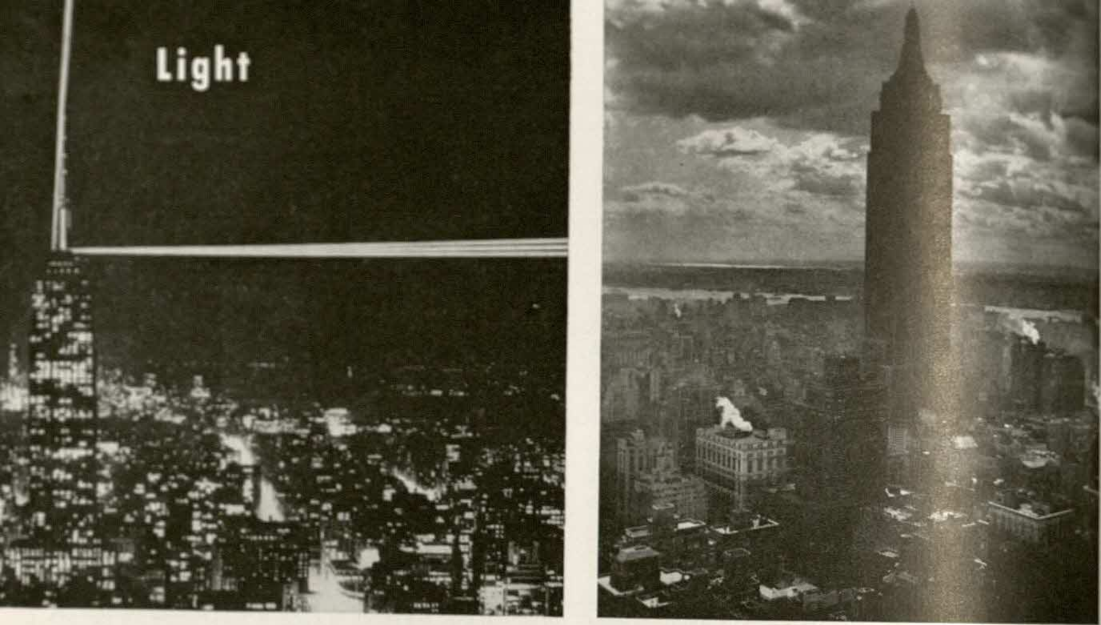
Life Jackets should be worn for safety by children and adults when they take boat rides on any open water.

Robert Jones, A. Devaney

Kapok-Filled Life Jackets are one type used by the U.S. armed forces. The collar helps keep the wearer's head above water.

U.S. Navy

Light



Westinghouse Electric Corp.; H. Armstrong Roberts

Artificial Light and Natural Light Bring Out Different Features of a Large City Such as New York City.

LIGHT is a swift messenger that comes to us from tiny invisible worlds of atoms and from the enormous worlds of distant stars. Through light we can tell the different atoms apart and discover many of the inner secrets of matter. Light also reveals the motions of planets, stars, and universes.

Light also is important in many other ways. The light given off by the sun rules our daily life. Most of us work when it is day and rest when it is night. Sunlight is the source of energy for plants. Without sunlight every living thing would starve to death, because all living things are dependent upon the food that plants make or upon other living things that eat that food. The changing pattern of sunlight on the earth determines the seasons.

Sunlight also has stored energy hundreds of feet below the surface of the earth in the form of coal. This coal is the remains of plants that were given energy from the sun thousands of years ago. When we burn coal to make electricity for electric lights, we can say that the lights in our homes were produced by the sunlight ages ago.

Man has learned to control the various forms of energy which can be turned into light. As man's methods of using light improve, his activities become more and more independent of daylight. Thanks to electricity, factories may run for the full twenty-four-hour period, people can enjoy recreation at night, and trains and airplanes can travel at night as well as in the daytime.

The Nature of Light

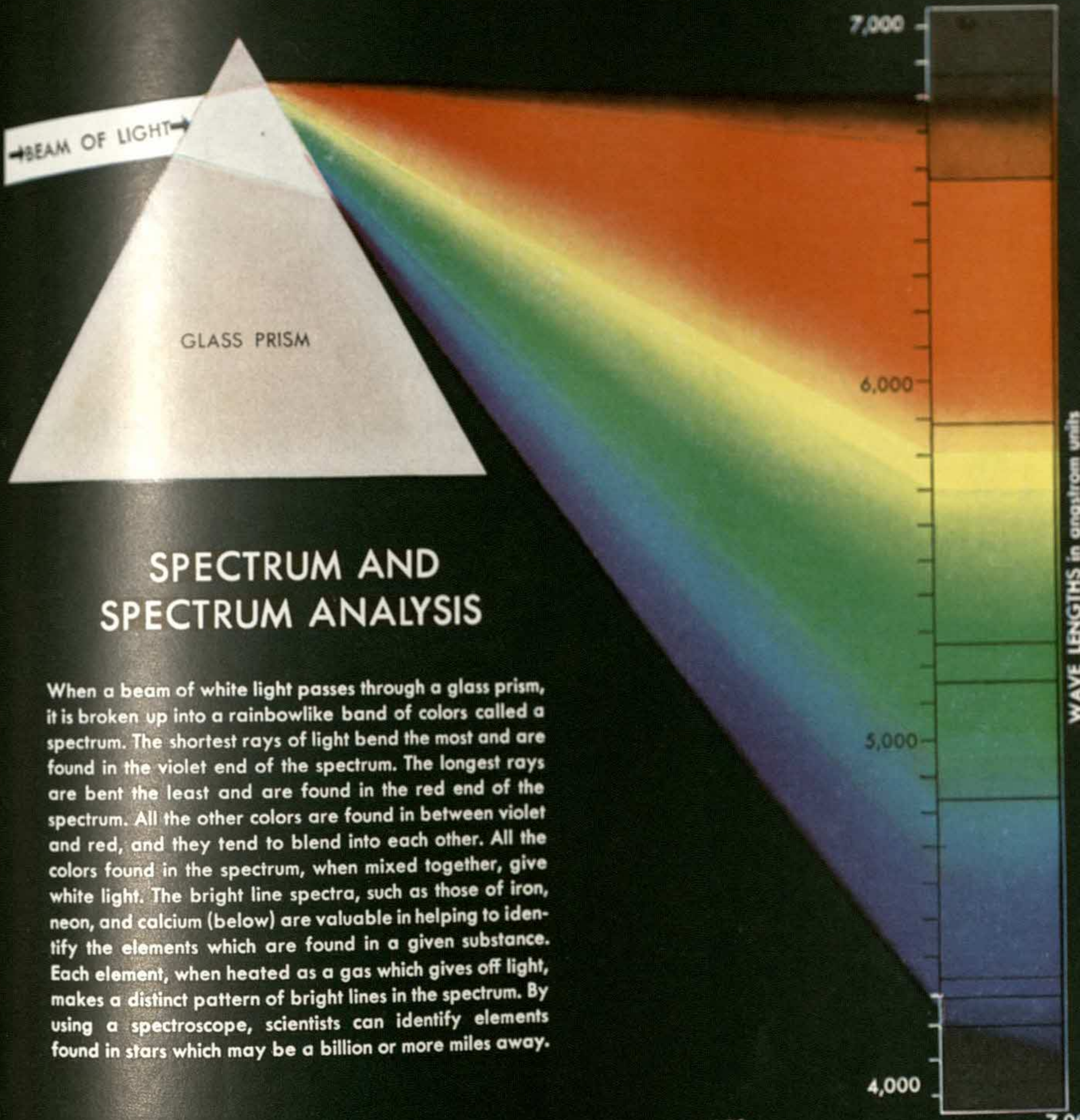
Before modern scientific times, people thought that light was something that traveled from our eyes to an object which we saw. Later on men began to study light scientifically and developed the science of optics. This science deals with the nature and qualities of light. In the 1500's and 1600's scientists developed lenses, microscopes, and telescopes. These gave man new ways in which he could use light in order to see farther and to see smaller things than he could see up to that time.

In 1666 Isaac Newton sent a beam of white light through a glass prism which broke the beam up into a band of colored lights resembling a rainbow. This band is called a *spectrum*. Newton showed that what we ordinarily think of as white light is actually made up of light of different colors. Newton experimented further with light and decided that it was made up of tiny particles which he called *corpuscles*. He developed a *corpuscular theory* of light which was based on the fact that light traveled in straight lines. But we now know that light does not travel exactly in straight lines.

If we watch small waves of water traveling on the surface of a pond, we will see that when they strike an obstacle they are not abruptly cut off. Some of the waves seem to slip around the edge of the obstruction. The Dutch physicist, Christian Huygens, who lived at the same time as Newton, noticed that the edges of shadows of objects were not sharp. This led him to believe that light behaved as waves behave in water. His investigations gave rise to the *wave theory* of light.

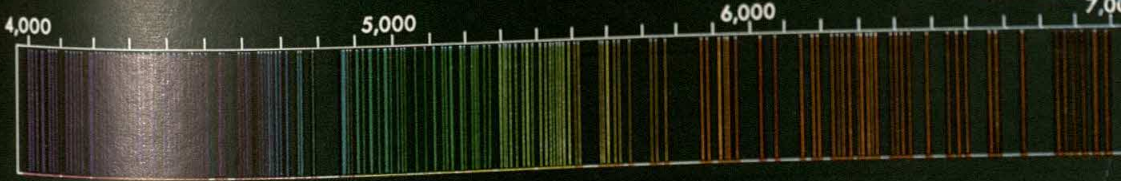
For many years an argument raged between scientists who believed that light consisted of corpuscles and scientists who believed that light was made up of waves. But in 1801 Thomas Young (1773-1829) established convincing proof that light moves as waves do.

Further experiments have given other proof. The bending of light around the sharp edges of obstacles is called *diffraction*. The light that extends beyond the edge of a shadow consists of a thin band that looks like waves. Other experiments revealed a characteristic of light behavior called *interference*. If waves of water move toward each other from two different directions, in some places the waves tend to increase each other and in others they tend to neutralize each other. What happens depends on where the crest and trough of the waves meet. The same thing appears to be true of light. If two rays of light interfere with each other so that dark and bright bands can be seen, the dark bands are where the waves have

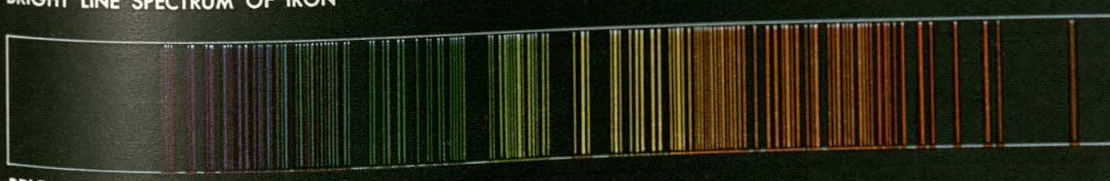


SPECTRUM AND SPECTRUM ANALYSIS

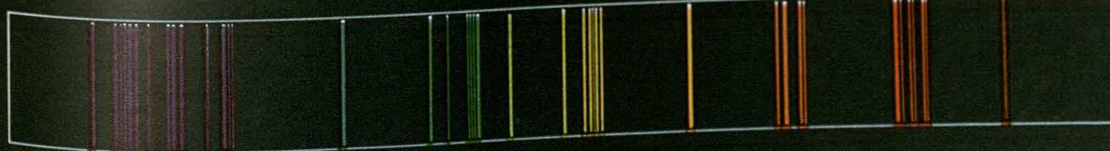
When a beam of white light passes through a glass prism, it is broken up into a rainbowlike band of colors called a spectrum. The shortest rays of light bend the most and are found in the violet end of the spectrum. The longest rays are bent the least and are found in the red end of the spectrum. All the other colors are found in between violet and red, and they tend to blend into each other. All the colors found in the spectrum, when mixed together, give white light. The bright line spectra, such as those of iron, neon, and calcium (below) are valuable in helping to identify the elements which are found in a given substance. Each element, when heated as a gas which gives off light, makes a distinct pattern of bright lines in the spectrum. By using a spectroscope, scientists can identify elements found in stars which may be a billion or more miles away.



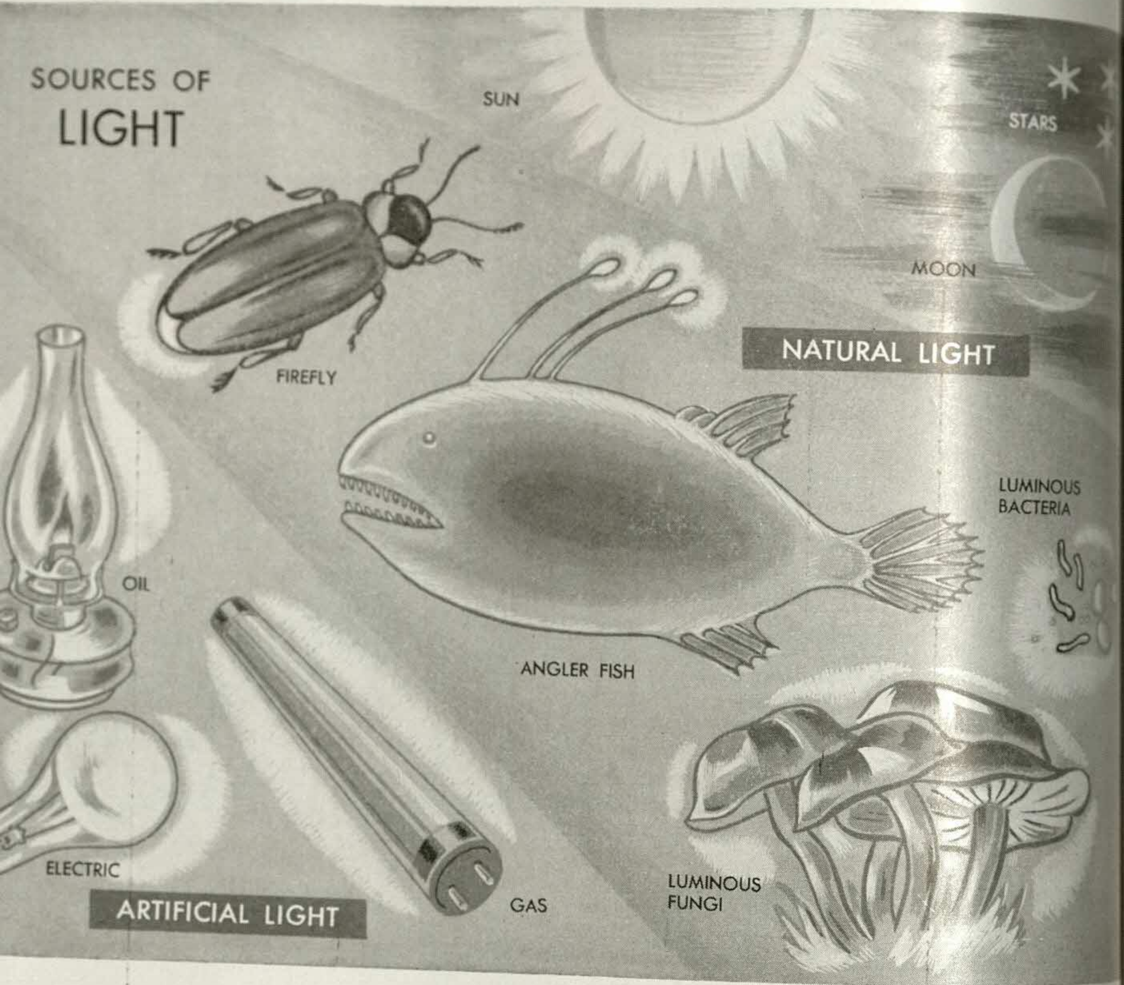
BRIGHT LINE SPECTRUM OF IRON



BRIGHT LINE SPECTRUM OF NEON



BRIGHT LINE SPECTRUM OF CALCIUM


SOURCES OF LIGHT

neutralized each other by the crest of one meeting the trough of another. The bright bands are where two crests or two troughs meet.

Light waves are different from sound waves. Light waves vibrate in all directions at right angles to the direction in which the ray of light is traveling. Therefore they are termed *transverse* rays. Sound waves, however, vibrate in the direction in which they are traveling. They are termed *longitudinal* waves.

Scientists knew that waves such as those they had already found in sound could not pass through a vacuum, or a space without air in it. If light consisted of waves, it had to pass through some material capable of transmitting light waves just as sound waves could travel only in air. Such material had to be transparent and fill the spaces between the stars where there is no matter in the usual sense. The scientists imagined that something filled all space and called it the *ether*.

In 1860 the noted English physicist James Clerk Maxwell developed the *electromagnetic theory* of light. This stated that light waves were electrical in nature instead of being mechanical as sound waves are.

The final development of the theory of light came in 1900 when Max Planck stated the idea that light consists of definite little packages of energy known as *quanta*. The amount of energy in each individual quantum depends upon the length of the light wave, or the number of times it vibrates in a second. Planck's studies brought about the *quantum theory*, which established that light is corpuscular in its nature but apparently travels in waves. This combined the theories of Newton and Huygens. Experimenting is still being done to weave all the facts into one theory.

Electromagnetic Waves

Radios depend on electromagnetic energy of certain wave lengths. We can turn a knob and pick the wave lengths that carry our favorite programs. Our eyes, like our radio set, are sensitive to a certain range of electromagnetic energy. Our eyes are sensitive to the electromagnetic waves that are most abundant in sunlight. The part of the spectrum of sunlight which our eyes can see is called *visible radiant energy*, or light.

Some light also contains rays which we cannot see. Those which have shorter wave lengths than we can see are called *ultraviolet* rays. They produce sun tan. Those that have longer wave lengths than the ones we can see are called *infrared* rays. These are given off by all warm objects. Actually our eyes are sensitive to only about 3 per cent of all electromagnetic waves.

The objects we see about us reflect light to our eyes. But if we were standing in a room in which there were no objects to reflect light, not even particles of dust, we could turn on a flashlight and be unable to see the beam of light. Far above the earth's surface where there is no dust to reflect light, the sun and the stars are bright but the sky is black.

The longest wave lengths of electromagnetic energy are measured in miles. The shortest wave lengths are found in cosmic rays, and are measured in tiny fractions of a millionth of an inch. The most important kinds of electromagnetic energy in terms of increasing wave lengths are: cosmic rays, gamma rays given off by radium, X rays, ultraviolet rays, visible light, infrared or heat waves, radio waves, and electric waves.

When visible light is passed through a glass prism it is broken up into the colors that make it up. The wave lengths of the various colors also differ among themselves. The violet rays are the shortest and the red rays are the longest. The violet rays have wave lengths about half as long as those of the red rays. The chief colors found in visible light are violet, blue, green, yellow, orange, and red. But by separating the colors, we can see more than a hundred different colors.

Speed of Light

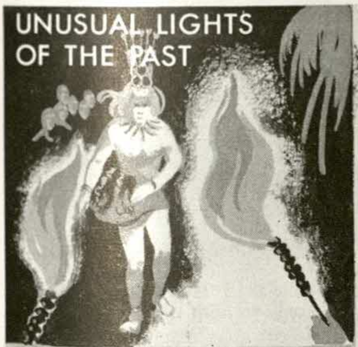
When we pull up the shade of a darkened room the light seems to cross the room and reach the opposite wall immediately. Actually astronomers have known for a long time that it takes time for light to travel from one place to another. Astronomers know this because they deal with enormous distances. According to modern discoveries, the speed of light is the fastest possible speed. It is used for the measurement of both the movement of atoms and the great distances in space. The speed of light was measured in a series of experiments by Professor Albert A. Michelson of the University of Chicago. He found that light travels in a vacuum at the rate of 186,284 miles per second, or 299,796 kilometers per second. But measurements conducted by scientists since 1950 show the speed of light to be 186,282 miles per second, or about 299,792 kilometers per second.

The earliest attempts to measure the speed of light were made in 1675 by Olaus Roemer (1644-1710), a Danish astronomer. He noticed that when the earth is farthest away from Jupiter, it takes sixteen minutes more time for one of Jupiter's moons to enter the shadow of the planet than when the earth is nearest Jupiter. The diameter of the earth's orbit, or path around the sun, is about 186,000,000 miles. This meant that it took about sixteen minutes for the light to travel across the diameter of the earth's orbit.

Using these figures, Roemer calculated that the speed of light was about 192,000 miles a second, which is not very far from the figure now used.

If the sun were suddenly to stop giving light we would still continue to see it for about eight minutes, for it takes about 500 seconds for light to travel from the sun

UNUSUAL LIGHTS OF THE PAST



Oil-Rich Doodoe Nuts are strung together one above the other to make torches in Polynesia.

A Lump of Fat fastened to the end of a stick was used as a torch by Kubla Khan's pony express.

Oil-Soaked Sticks fastened to a long pole bound with metal were used in Rome.

Palm-Tree Torches of the Indians were the lights Columbus saw ashore on Oct. 12, 1492.

Twisted Strips of Birch Bark were used as torches by the Iroquois Indians in New York state.

A Gourd Full of Holes and filled with fireflies gave off a dim light in the West Indies islands.

SES OF ELECTROMAGNETIC WAVES

ll radiant energy exists in the form of
lectromagnetic waves which can be ar-
anged in a table of decreasing lengths.
he longest waves, at the bottom of the
olumn, are hundreds of miles long. The
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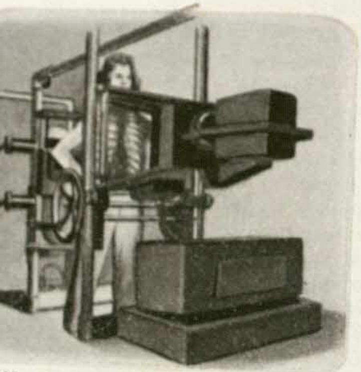
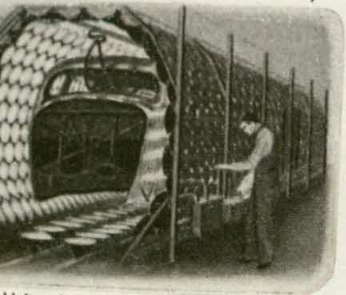
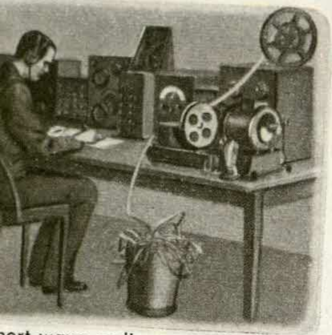
onth of an inch. The illustrations show
ome of the uses of these waves.



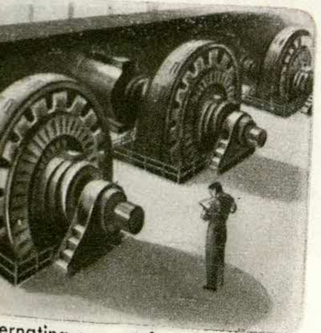
X rays penetrate the human body



Using heat rays to bake enamel



hort-wave radio communication



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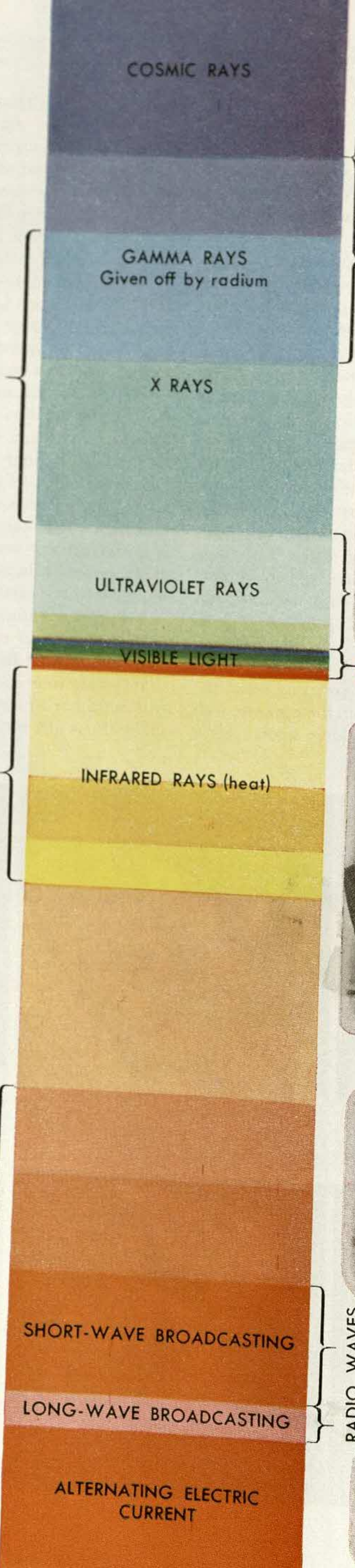
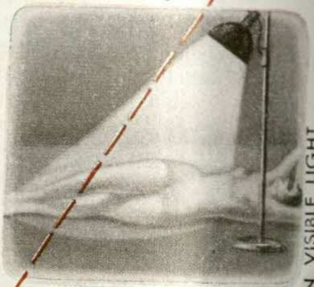
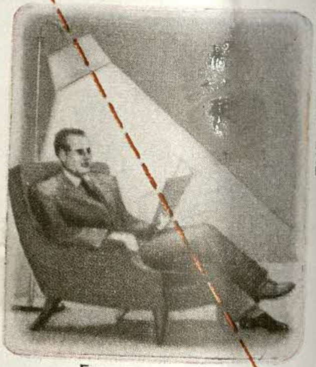


Cosmic rays
come from oute

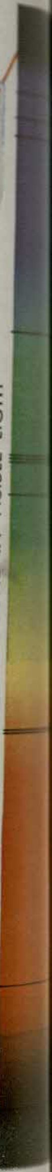
Radium rays
used in treating cancer



Ultraviolet rays
produce sun tans



Eyes respond
only to light waves



THE COLORS FOUND IN VISIBLE LIGHT

to the earth. On the other hand, if the North Star suddenly exploded we would not see the explosion for about 460 years because it takes that long for light to travel from that star to us. If we could sit upon the star Rigel with a very powerful telescope focused upon the earth, we would just be able to see the ships of Columbus reaching America for the first time.

It takes millions of years for light to reach the earth from the outer limits of the heavens. These distances are so vast that it is impossible to measure them conveniently in miles. For this reason, the distance which light travels during one year was adopted as a unit of measurement. This is called a *light-year*. Light travels nearly six million million miles in one year. To get an idea of the vastness of this figure, suppose a clock had been set to ticking seconds 32,000 years ago. From that time to this it would have ticked only about a million million times, one sixth of the number of miles that light travels in one year.

The speed of light is the distance a light wave travels in one second. The number of light waves that pass a given point in one second is called the *frequency* of the light waves. The frequency of a light wave is found by dividing the speed by the wave length, which is the distance from the crest of one wave to the crest of the next one. The short waves found in violet light are so small that it takes about 63,500 of these wave lengths to equal one inch. The frequency of violet light is 750,000,000,000,000 per second. This is found by dividing the speed of light in inches per second by the wave length in inches.

Behavior of Light

By observing the behavior of light, man has learned to make optical instruments, searchlights, and many other devices for studying and using light.

Reflection and Refraction. If an object permits light to pass through it, as a clear pane of glass does, it is called *transparent*. If an object scatters the light that passes through it as a frosted glass or a layer of milk does, it is called *translucent*. An object that does not permit light to pass through it is *opaque*.

A mirror or a polished surface reflects light without scattering it. This type of reflection is called *regular* or *specular*. A ray of light is reflected from such a surface at an angle equal to that at which it arrived at the surface. This is known as the *angle of reflection*. The *angle of incidence* is the angle between the ray of light and a line drawn perpendicular to the surface. In all cases of regular reflection, the angle of reflection is equal to the angle of incidence.

Some substances such as white blotting paper or freshly fallen snow reflect light in all directions. This is termed *diffuse reflection*. A third kind of reflection is called *spread reflection*. It occurs when substances scatter light but not in a completely diffuse nor in a regular manner. A good example of such spread reflection is that from a sand-blasted glass or metal surface.

Light usually travels through a substance in a straight line. But it "bends" when it passes into another substance at an angle. For example, a light ray traveling through air will bend when it enters glass or water at an angle. A wedge of glass called a *prism* is used to bend light. This bending is called *refraction*. Water will bend light rays in the same way. A slanting log half sticking up out of water will appear to be broken. This bending of light is due to the fact that light travels at a slightly different speed in different substances. The part of a ray of light that strikes the refractive substance first is held back more, and consequently the light beam is bent toward a line drawn perpendicular to the surface. But if a ray of light passes into a substance in which light can move more swiftly, the ray of light is bent away from the perpendicular.

By using the principle of refraction, man can grind lenses which will bend light rays so that they will make objects appear to be larger or smaller. The telescope, the microscope, and reading glasses are examples of this use of the principle of refraction. On the other hand, a wavy glass with no regular pattern refracts light in different directions. The objects we see through a wavy glass therefore appear distorted.

If we look at a distant street lamp at night through a wire screen, we can see peculiar patterns on the screen, and even colored fringes. These fringes are due to the fact that the light is diffracted along the edges of the wires and the light waves tend to spread out. Scientists use diffraction gratings which may have 20,000 lines per inch cut on a sheet of glass or metal. These gratings are used to make spectra which are helpful in analyzing various substances. See DIFFRACTION (Diffraction Grating).

Spectrum Analysis. The spectrum of each substance differs from the spectrum of another substance in the same way that one set of human fingerprints differs from another set of fingerprints. Because of this, scientists can identify the composition of a substance by examining its spectrum. This study is known as *spectrum analysis*. Scientists use a device called the *spectroscope* to study the spectra of different materials. The spectroscope, like the diffraction grating, separates the different colors in the spectra.

In chemistry and physics, spectrum analysis can determine the atomic and molecular structure of a material. Industrial laboratories use it to discover the impurities in a product. Spectrum analysis also makes it possible to discover and study the elements that make up the planets in the solar system. See SPECTROSCOPE.

Polarized Light is made by cutting off all of the light waves except those that vibrate in a single direction. The methods for polarizing light are useful in cutting down glare from roads, in analyzing crystals, and in analyzing strains in glass.

Different kinds of surfaces reflect different amounts of light. White paper may reflect as much as 85 per cent of the light that falls upon it. The amount of light a substance reflects is called its *reflectance*. White paper has a reflectance of 85 per cent. Ordinary black paint reflects 2 to 4 per cent of the light that falls upon it. A colored surface may reflect 2 to 85 per cent of the light that falls upon it. Yellow reflects 50 to 75 per cent of the light, while blue and dark red may reflect only 5 to 10 per cent.

The light that is not reflected by the surface of an object is absorbed and heats the object. This can be demonstrated by painting similar pieces of sheet metal white, yellow, red, and black, and placing them on a layer of snow in sunlight. As these surfaces absorb the energy of the sunlight and become heated they melt the snow and sink into it. A light-colored piece of metal will sink more slowly than the others. The black piece of metal will sink most rapidly.

Effects of Light

Plants cannot grow without light. Plants use sunlight that acts upon the green coloring matter in them (chlorophyll) to separate carbon from the carbon dioxide of the air and hydrogen from water. Carbon, hydrogen, and oxygen are then formed into chemical compounds called *carbohydrates*. Plants store these carbohydrates to release future energy and to permit them to grow. All animals eat plants or eat other animals which eat plants. For this reason, sunlight is necessary for the life of every living thing.

It is true that men do not make the most efficient use of this sunlight. Sunlight containing energy equal to that found in several hundred tons of coal will fall upon an acre of ground from spring until fall. But the heat value of the energy of the crop of plants will be equal to only a fraction of that found in a ton of coal. If the sunlight fell on the earth continually as it does on a clear day in summer, it could melt a layer of ice about 300 feet thick each year. Man has attempted to make some direct use of this sunlight by using mirrors which focus the light upon pipes containing water. The hot water thus produced can be used in the home and elsewhere. Houses have been built which permit the low-lying sun of winter to send its rays inside the rooms and help heat them. Such houses are often called *solar houses* because they are partly heated by the sun.

Sunlight also is useful because it evaporates water. This water is carried off by the air and eventually releases rain or snow. In this way the electricity produced by water power, like the electricity produced by coal, actually depends upon sunlight.

Effects on the Body. The ultraviolet rays in sunlight produce Vitamin D in fatty substances of the skin. One result of this action is a greater supply of calcium for the growth of teeth and bones. Rickets can be prevented and cured by sunlight. On the other hand, too much exposure to sunlight can cause sunburn, and also *conjunctivitis*, which is inflammation of the surface of the eyes.

Photoelectric Effect. Certain chemicals give off small electric currents when they are struck by rays of light. This is called the *photoelectric effect*. This principle is widely used in the "electric eyes" which are found useful in counting people or objects, for opening doors, and in many other ways in industry. Scientists also have experimented with the photoelectric effect as a means of supplying a cheap source of electricity. However, the amounts produced are not yet large enough to be of practical use. See ELECTRIC EYE.

Photochemical Effect. Light also has the property of changing chemical compounds. Certain compounds of silver, for example, are blackened when exposed to light. This principle lies behind the entire science of photography.

Measuring Light

The standard measurement for light is the candle. It is based upon the flame of a standard candle about one inch thick. The intensity of illumination, measured horizontally at a distance of one foot from the flame, is one *foot-candle*. The amount of light on a surface depends upon the candle power of the source and varies inversely as the square of the distance from the source. This is the *inverse square law*.

Supposing a horizontal surface is illuminated by a source of 100 candle power ten feet straight up above it. The intensity of light at this surface is found by dividing 100 by the square of the distance, which is ten times ten, or 100. Therefore, the intensity of the light on the surface is one foot-candle. If the source were 1,000 candle power, the intensity of the light would be ten foot-candles. If the distance of a light source is doubled, the intensity of the light is reduced to one quarter. On the other hand, if the distance between the light and the source is reduced to one third, the intensity of light is increased nine times.

Suppose we have a hollow sphere with a radius of one foot, and a light source at its center that has an intensity of one candle power in all directions. The rate at which the light would fall upon each square foot of the inside surface of the sphere is called a *lumen*. There are 4π square feet on the inner surface of the sphere. Therefore, a source of one candle power in all directions gives off light at the rate of 4π or 12.57 lumens. Therefore, one foot-candle is produced by light falling at the rate of one lumen per square foot. The output of all light sources is now rated in lumens. Their efficiency is determined by the watts necessary to produce a lumen and is expressed in *lumens per watt*.

Sources of Light

The sun is our most important light source. On a clear midsummer day at noon, the intensity of light on the earth's surface sometimes reaches 10,000 foot-candles. This is the equivalent of the light on a surface one foot away from a source of 10,000 candles. But, the sun is about ninety-three million miles away. Therefore, if we divide the candle power of the sun by the square of its distance, we will have the number of foot-candles on the earth's surface. By this process we find that the sun as a light source is equal to 2.5 billion billion billion candles.

We also see light from the sky called *skylight*, which is scattered sunlight. The particles of the air tend to scatter light of short wave lengths more than light of long wave lengths. That is why the sky looks blue. For the same reason, skylight is also rich in ultraviolet rays. We can get a sunburn from long exposure to a large patch of sky even though we may be shielded from the direct sunlight. At noon on a clear summer day about 20 per cent of the light that reaches the earth's surface comes from the sky. The remaining 80 per cent comes directly from the sun.

Man's earliest sources of light were flaming torches and campfires. These were inefficient and gave off much smoke. Then man invented lamps which were merely wicks dipped in oil. The oil burned and gave a somewhat better light. Candles were widely used during the Middle Ages. When gas lights were first introduced, the flame alone provided the light. Then gas mantles were invented which provided material that glowed brilliantly when heated by the gas flame. At the same time, lamps were developed that burned kerosene or whale oil. The first electric lights were arc lights. The light was produced by a flaming arc between two carbon rods.

The so-called incandescent lamp has a filament of metal which is heated to a glowing point. Platinum, carbon, tantalum, and tungsten have been used for these filaments.

Some modern lights depend upon the passage of electricity through a gas. A mercury lamp gives off light when an electric current is passed through a mercury vapor. Such a lamp also gives off ultraviolet rays. Fluorescent lights also depend on mercury vapor. They give off light when the ultraviolet rays resulting from the passage of electricity through a mercury vapor strike certain materials called *phosphors*. These substances in turn give off visible light.

The firefly is a common example of living things that give off light. Such living light is important because it is produced without the accompaniment of much heat. Scientists are busy studying such light because they believe that it may help man to produce a similar more efficient light.

MATTHEW LUCKIESH

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Outline

I. The Nature of Light
II. Electromagnetic Waves
III. Speed of Light
IV. Behavior of Light
  A. Reflection and Refraction
  B. Spectrum Analysis
  C. Polarized Light
V. Effects of Light
  A. Effects on the Body
  B. Photoelectric Effect
  C. Photochemical Effect
VI. Measuring Light
VII. Sources of Light

Questions

How may the sunlight of ages ago be used to light our homes today?

What do scientists mean by *ether*?

What are ultraviolet rays? Infrared rays?

Could we see light in an entirely empty space? Explain.

What is the speed of light? Who discovered it?

Why does a slanting log sticking out of the water appear broken at the surface of the water?

What principle of light behavior does man use in making eyeglasses?

How may sunlight produce water power?

What quality of light makes photography possible?

What are some living things that give off light? How are these important to the scientist?

LIGHT, ELECTRIC. See ELECTRIC LIGHT.

LIGHT, INVISIBLE. See ULTRAVIOLET RAYS.

LIGHT BRIGADE, CHARGE OF THE. See BALAKLAVA, BATTLE OF.

LIGHT HEAVYWEIGHT. See BOXING (The Classes).

LIGHT-HORSE HARRY LEE. See LEE, HENRY.

LIGHT LISTS. See NAVIGATION (Aids).

LIGHT METER refers to several kinds of instruments that have been invented for measuring light. They are useful to scientists, and also to photographers, astronomers, eye specialists, and illumination experts.

The *photometer* is a device that measures the strength of one light by comparing it with another of known strength. Various photometers involve a viewing field of two parts. One part is illuminated by one light source, and the other by a source of known candle power. The distance of one light source is adjusted until the illumination on both parts of the field is the same. The intensity of light varies inversely as the square of the distance from the source. This is known as the *inverse-square law*.

The *wedge* photometer compares two rays by dimming the brighter one with a wedge that absorbs light. When the rays are equal, a reading is taken from a scale on the wedge. The *polarization* photometer dims the rays with a polarizing material. Astronomers use wedge photometers to measure the brightness of stars. The star to be measured is compared with a standard light, and this is compared with a star of known magnitude.

General Electric

A Light Meter used by photographers indicates how much light is shining on an object.

Photographers use a photometer by which they sight their subject and an electric lamp through the same eyepiece. When the lamp is dimmed so that it can barely be seen, it equals the light coming from the subject. From the amount of dimming, the photographer can roughly determine his shutter speed.

The *actinometer* measures light by its chemical effects, such as the time it takes to darken a bit of photographic paper. The *extinction meter* is another sighting device, with a sliding wedge for dimming the view. When the photographer cannot tell shadows apart, he takes his reading from a scale on the wedge.

A popular type of light meter uses the photoelectric cell. Light produces an electric current when it falls on certain metals. The cell contains a film of suitable material connected to a sensitive meter, which measures the current. This indicates the intensity of light.

Light-meter scales give readings in foot-candles (lumens per square foot), or a scale or number that can be translated into any other unit. Some meters give the camera adjustments needed for different light intensities.

MATTHEW LUCKIESH

See also CANDLE POWER; FOOT-CANDLE; MICHELSON, ALBERT ABRAHAM.

LIGHT SWITCH. See ELECTRIC SWITCH.

LIGHT-YEAR is the distance light travels in a year at an approximate speed of 186,000 miles per second. See ASTRONOMY (The Heavens as Astronomers See Them); LIGHT (Speed of Light).

Ewing Galloway

The Short Stone Lighthouse on Monhegan Island, Maine, stands atop a high hill to bring the light high above the water.

Louis C. Williams

The Tall Octagonal Tower of the Lighthouse at Fenwick, Conn., guards the busy mouth of the Connecticut River.

LIGHTHOUSE. Men have used some form of lighthouse for almost as long as they have sailed the open seas. For hundreds of years, storm-driven sailors have searched anxiously for lights to warn them that land was near, or to point out dangerous rocks and reefs against which a ship might be dashed to pieces. The ancient Libyans built towers on the northern coast of Egypt to guide the sailors on the Mediterranean. They filled metal baskets with burning coal or wood and hung them from poles on top of the towers. A lighthouse built about 300 B.C. on the island of Pharos near Alexandria in Egypt was one of the seven wonders of the ancient world. It was called the Pharos of Alexandria.

The Romans built lighthouses at many of their ports. After they conquered Britain, they built lighthouses on both sides of the English Channel, at Dover and Boulogne, to guide ships crossing the channel. The tower at Boulogne was still used during the Middle Ages, as were several of the other Roman lighthouses.

Modern lighthouses are built at ports and harbors, on isolated rocks, and some on capes and headlands. Others are some distance from shore, with their foundations sunk beneath the water. They must be very strong for they are exposed to furious ocean gales and driving waves. Most of them are tall, round, stone towers, narrow at the top. Others are made of iron frames, cast iron, or reinforced concrete.

The tower lighthouses have rooms one above the other connected by a winding stairway. The keepers often lead lonely lives, and many writers have described their faithfulness and heroism.

The Light. The lantern that houses the light is a most important part of the lighthouse. It is the complicated mechanism that enables the light beam to carry far out to sea. The lens is usually shaped somewhat like a barrel. It may be 8 feet high and 6 feet in diameter. These large lights can be seen 20 miles away. Most of them send a flashing light which can be seen every few seconds.

The light is made to flash by revolving the lens around the lamp. Part of the lens is blacked off by a screen so that the light is hidden for several seconds each time the lens revolves. The lens and lamp are sheltered in a glass and steel enclosure known as "the lamp room." Each lens-face has a large plane convex section of its own surrounded by several rings of prisms. The prisms reflect light along the path of focus and make the main light stronger. Some of the largest lenses have 200 prisms.

The entire lens is placed on a frame that either revolves on rollers or floats in a tank of mercury. It is operated by a clocklike device that is kept in motion by a suspended weight or by an electric motor. The flashing light can be seen only when the lens is directly facing the person who is looking at it. When any side is covered with colored glass, colored light passes through. Then a flashing light may give out a series of flashes, of different colors.

The United States also has many small, automatic lights placed along rivers and lakes, and at hundreds of points along the coasts where building a lighthouse would be too expensive. These lights have small lenses made of pressed glass. One type is operated by electric batteries. Another type uses compressed acetylene gas.

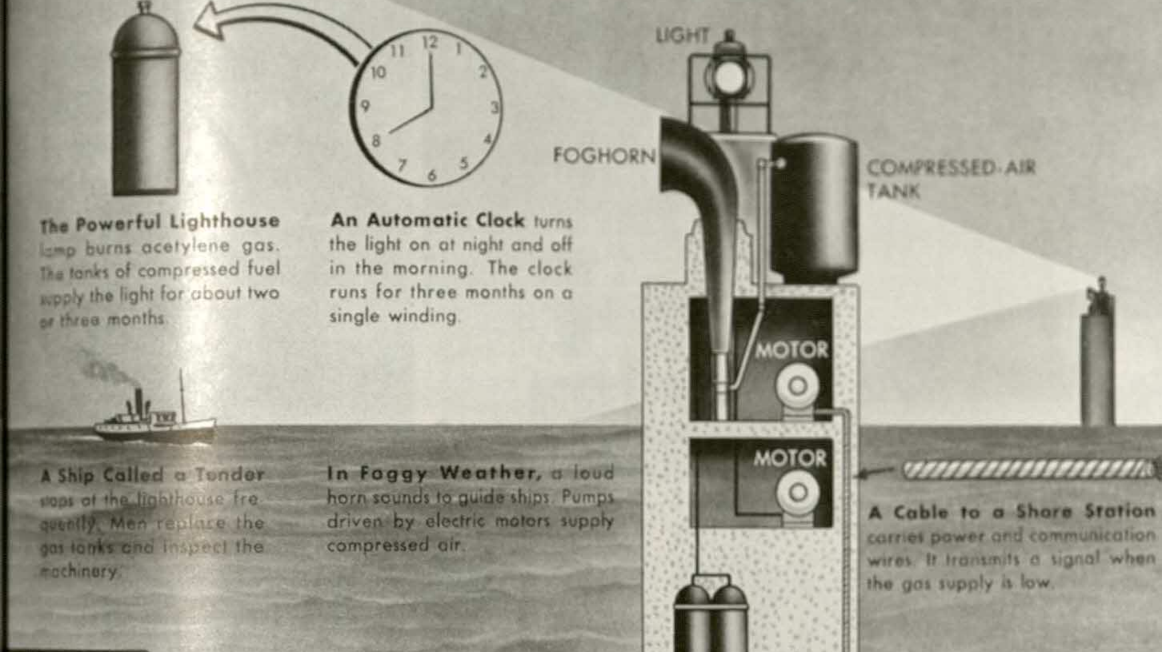
Many lighthouses are equipped with *radio beacons* that send out radio signals that can be picked up by shipboard radio direction finders (see DIRECTION FINDER). These are useful for long-distance navigation and in foggy weather. Almost all lighthouses have fog signals.

Identifying Lighthouses. Lighthouses give out one of five basic types of signals. These are (1) *fixed*, a steady light; (2) *flashing*, or periods of darkness longer than periods of light; (3) *occulting*, with the flashes of light lasting as long as the dark period or longer; (4) *group flashing*, two or more flashes at regular intervals; (5) *group occulting*, a fixed light with two or more periods of darkness at regular intervals. There are several variations of these basic patterns.

Navigators have to know what light they are seeing so that they can find it on their charts and use it to plot their positions (see NAVIGATION [Near Land]). For waters off the United States, navigators use a publication called *Lists of Lights* published by the United States Coast Guard. This publication gives the characteristics of the signals, including their color, for the lighthouses, lightships, and beacons of the United States. The United

LIGHTHOUSES WITHOUT KEEPERS

How a Lighthouse Works Automatically



The Powerful Lighthouse lamp burns acetylene gas. The tanks of compressed fuel supply the light for about two or three months.

An Automatic Clock turns the light on at night and off in the morning. The clock runs for three months on a single winding.

A Ship Called a Tender stops at the lighthouse frequently. Men replace the gas tanks and inspect the machinery.

In Foggy Weather, a loud horn sounds to guide ships. Pumps driven by electric motors supply compressed air.

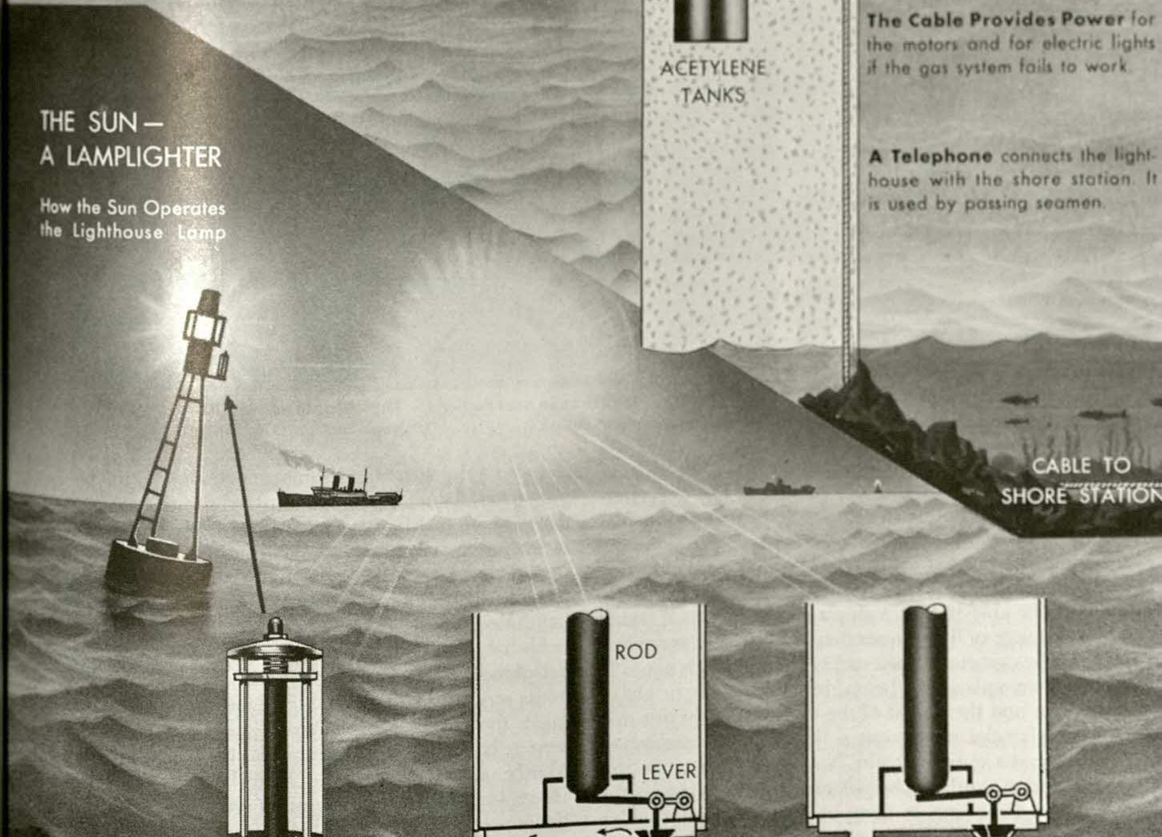
A Cable to a Shore Station carries power and communication wires. It transmits a signal when the gas supply is low.

The Cable Provides Power for the motors and for electric lights if the gas system fails to work.

A Telephone connects the lighthouse with the shore station. It is used by passing seamen.

THE SUN — A LAMPLIGHTER

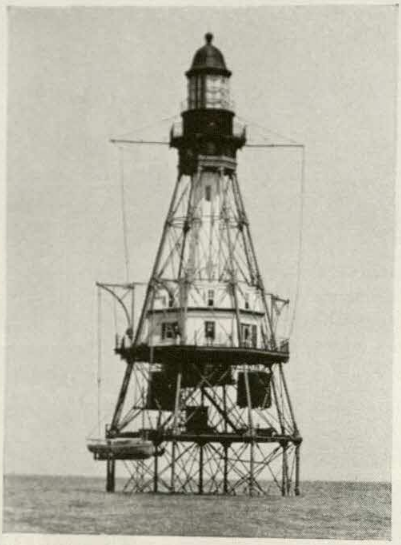
How the Sun Operates the Lighthouse Lamp



When the Sun Sets, the rod contracts as it becomes cooler. The valve controlling the gas supply opens and the lamp sends out its brilliant beam. Even on dark and stormy days the light turns on

The Light is Turned On and Off by a device called a sun valve. As the rising sun strikes a blackened rod, heat is absorbed and the rod expands. By pushing a lever, it closes the gas valve and shuts off the light.

The Old Lighthouse at Cape Henry, Va., is built of bricks.



The Spiderlike Frowery Light warns ships away from a reef on the Florida coast.

Lighthouse stands on the east bank of the Mississippi River at East St. Louis, Ill.

This Old Spanish Lighthouse stands on the Atlantic Coast near Miami, Fla.

Cape Elizabeth Lighthouse near Portland, Me., has an ornamental design.

The Highland Lighthouse throws its beam on Cape Cod.

Gendreau; H. Armstrong Roberts; WPA; H. Armstrong Roberts; Louis C. Williams; Titcomb, Black St

States Navy Hydrographic Office publishes lists of lights for lighthouses in other countries. The characteristics of each lighthouse are also indicated on navigation charts.

Navigators also want to know how far away they can expect to see a lighthouse so they can look out for it, and also to be able to plot a ship's course so that it comes within range of lighthouses they want to use for navigation. The distance a light can be seen depends not only on the strength of the beam, but also on the height of the light and the height of the observer. Light lists and charts give the range that a light can be seen by an observer at a specific height. Navigators have to use this information, and the height of the light given in the charts or light lists, to compute the distance at which they will be able to see the light.

Famous Lighthouses. One of the most famous lighthouses is the Eddystone, which stands on a dangerous group of rocks in the English Channel. Its lantern is 133 feet above the water, and the tower is built of interlocking stones. Some of the famous lighthouses in North America are at Minot's Ledge in Massachusetts, Spectacle Reef in northern Lake Huron, and the series of iron skeleton towers on the Florida Reefs. The most powerful lighthouse in the United States is the Navesink lighthouse, at the entrance of New York Harbor. Its lamp has a strength of 9,000,000 candle power.

Lighthouse Services. Almost every nation has a lighthouse service. The United States Lighthouse Service is under the United States Coast Guard. The Canadian service is under the direction of the Department of Marine and Fisheries. In Great Britain the Trinity House Corporation is responsible for taking care of the lights.

JOHN J. FLOHERTY

See also BEACON; LIGHTSHIP; NAVIGATION (Aids); SEVEN WONDERS OF THE WORLD; STEVENSON, ROBERT.

LIGHTHOUSE OF THE PACIFIC. See EL SALVADOR (Land Regions).

LIGHTING

Blazing Street Lights have turned the downtown areas of cities, such as Chicago's Loop, into great white ways.

Chicago Sun-Times

Indirect Lighting can provide soft, well-balanced light for indoor living. The lights may be concealed along the edges of a ceiling or in decorative wall fixtures.

General Electric Co.

S. C. Johnson & Son, Inc.

A Gleaming Pillar of Light at night, this glass-walled office building is the headquarters of the S. C. Johnson Company in Racine, Wis.

LIGHTING. We live in a world in which we learn through and work with our eyes. Much of our learning is done indoors in the schoolroom. Most persons work indoors in factories, offices, and stores. Therefore, it is important that we study and work in rooms that are well lighted. In dim light or glaring or unsuitable lighting our eyes tire easily and our muscles become tense. We may suffer from headaches, dizziness, and indigestion. We are not so efficient as we would be with proper lighting.

Good lighting results from proper planning. We do not need the same amount of light to play checkers as to read the newspaper. A toolmaker and diemaker need much more light than a clerk in a store does. The color of our indoor lights also is important. Many department stores have lights in their dry-goods departments that duplicate the colors of sunlight. This is so that fabrics will look the same indoors as they do outdoors. Most incandescent electric lights give off a yellowish light. This makes little difference in reading, for example, but it would if we were trying to match colors. The color of the light from fluorescent lamps is controlled by the use of fluorescent powders. Such lamps produce good imitations of natural daylight.

The Principles of Good Lighting

The more easily we can see things the more efficiently we can work. This ease of seeing depends upon four important factors: (1) the size of the thing at which we are looking; (2) the amount of light made available by lighting; (3) the contrast between the object and its background as, for example, this type and the white paper; and (4) the time that is necessary to be able to see things.

All these factors work together. For example, if we wish to see something very small, the more light we have upon it the better we will see it. If we have only a little time in which to see an object, the more light that is upon it the better we will be able to see it. If there is little contrast between an object and its surroundings we also must have more light.

Brightness is the amount of light that is available.

PRINCIPLES OF GOOD LIGHTING

Pittsburgh Plate Glass Co.

Natural Light provides one of the best kinds of light. You can save your eyesight by working or relaxing near windows.

General Electric Co.

When Writing, or doing other kinds of close work, proper lighting is essential to avoid eyestrain. The lights should be placed in front and to one side so that your shoulders, arms, or hands do not cast a shadow.

It ranks as the most important factor in seeing. Plans for lighting should provide the greatest possible light needed for any task.

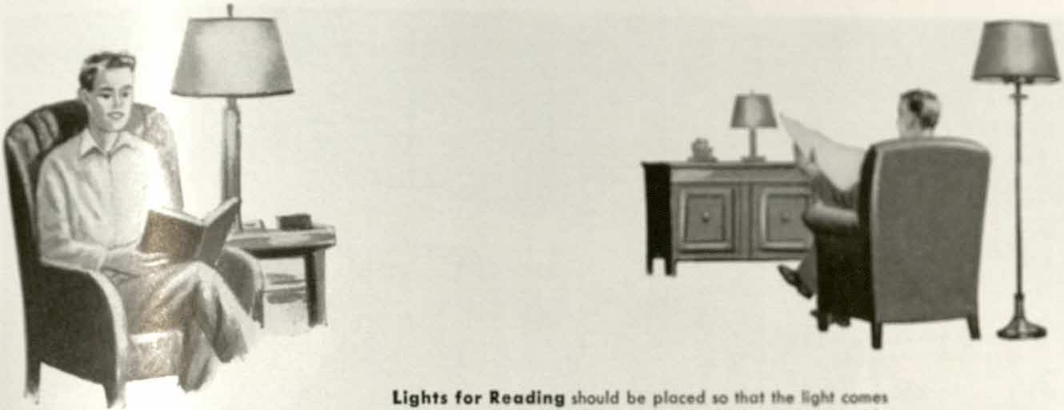
Scientists measure the intensity of light in units called foot-candles. A *foot-candle* is the amount of light that falls upon an object one foot away from a standard 1-inch candle. See FOOT-CANDLE.

Different kinds of work require different amounts of light for efficiency. About 10 foot-candles may be enough light to read 8-point printed type, which is type slightly smaller than that which you are reading. But with more light the task of reading becomes easier. If you were to read your own handwriting in pencil, you should have more light than for reading black print. And reading a newspaper requires several times as much light as this printed matter because newspaper type is not printed as well. If you want to sew white thread on a white cloth, 100 foot-candles or more are desirable. You should have several hundred foot-candles to sew black thread on a dark cloth, which is one of the most difficult seeing tasks. Generally, levels below 10 foot-candles are not suitable for prolonged reading.

But it is not only necessary to have enough light upon the work that is being done. You also have to make sure that the surroundings of the work are lighted. The best conditions for the surroundings are those in which their brightness approximates that of the work being done. If the surroundings are much brighter or much darker than the surface of the desk on which you are working, you will not do the work as easily or efficiently. Every time you look up from your work, your eyes will have to adjust themselves to a different brightness. Many people read at home under a lamp that throws light only upon what they are reading and leaves the rest of the room in darkness. This is a very bad practice for it tires the eyes and causes general physical fatigue. For the same reasons, you should not watch a television program in a completely darkened room. You should at least have a small lamp placed on top of your TV set.

The direction from which the light comes also is important. Many people believe that, in reading or writing, the light should always fall from over the left shoulder. This idea probably developed because most people are right-handed, and, if light comes in over the right shoulder, the shadow from the hand may fall upon the page in writing. For this reason, many schoolrooms are arranged with the light from the windows coming from the left.

Glare. Even more important than the direction of the light is the problem of glare. Glare is produced by any light that comes into the eyes directly from a bright source of light. For example, one source of glare is an unshaded light bulb hanging from the center of a room that allows the light from above to fall directly into the eyes of anyone in that room. Glare makes seeing more difficult. It is annoying and may even become painful. An extreme example of glare is the headlights of an approaching automobile on the highway at night. Such glare can blind another motorist temporarily and cause a serious accident. For this reason, you should always



Lights for Reading should be placed so that the light comes over a shoulder, *left*. Other lights should be on to provide balanced lighting and reduce harsh contrasts of light and dark.

Watching Television should not be done in a darkened room. The room should be provided with soft lighting that does not compete with the TV screen.

General Electric Co.

lower, or dim, your lights when approaching another car.

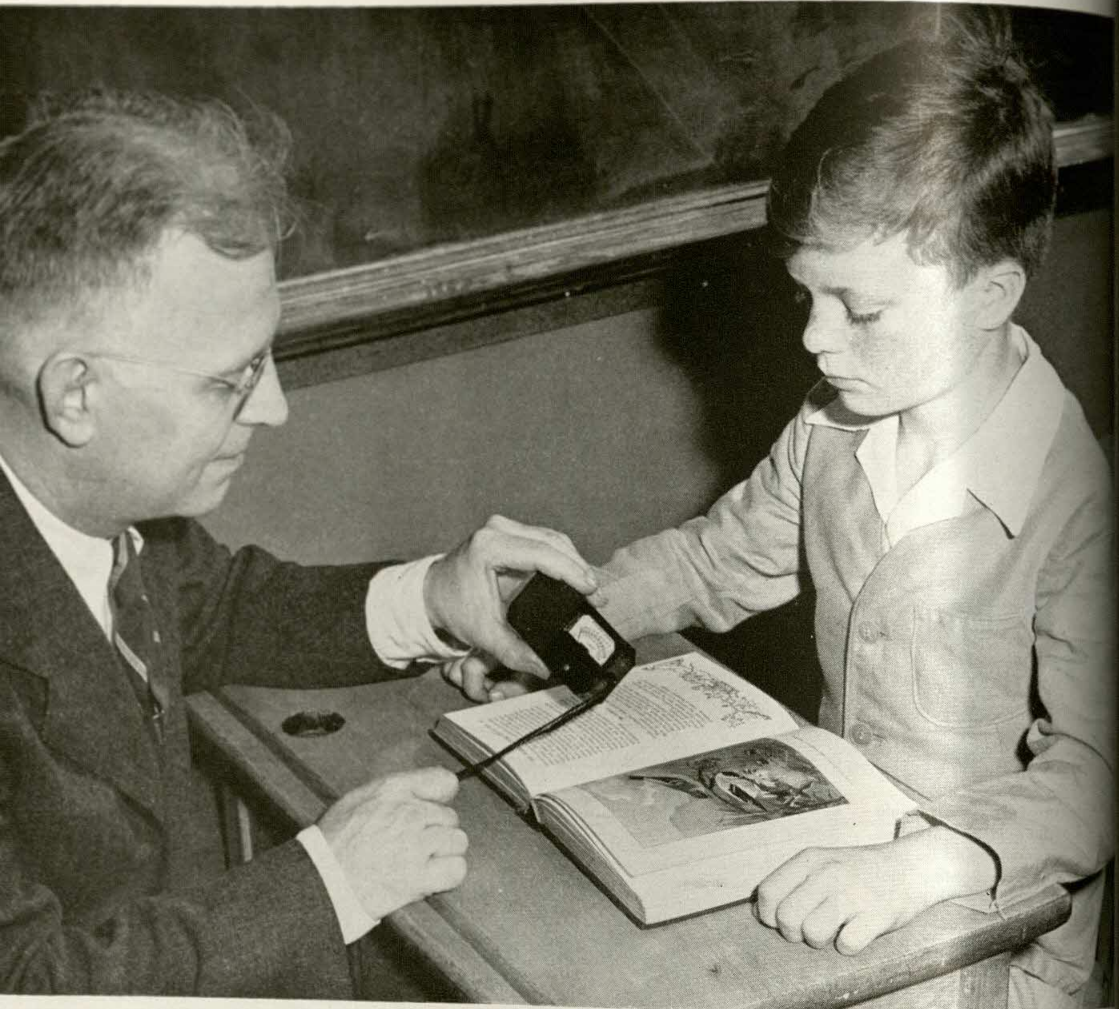
Glare is reduced by placing the source of the bright light farther from our line of sight. Glare can be avoided by using incandescent light in which the light is thrown from an opaque shade directly toward the ceiling and then diffused on the wall or the ceiling. But if such *indirect* lighting is used, make sure enough foot-candles of light are available for reading and working.

Glare also can be avoided by using a partly opaque shade that focuses the light downward. Some light bulbs are frosted on the bottom to cut down glare. Books or magazines which are printed on slick paper should be held so that they do not reflect bright images of the light sources into the eyes.

Color. Under ordinary circumstances the various kinds of electrical sources of light provide satisfactory color ranges for most work. Some lights, such as fluorescent lights, duplicate the colors found in the sunlight. Others such as sodium lights provide a single colored light. In the case of sodium, this light is bright yellow and everything under it looks yellow. Such a light has been found useful for lighting highway crossings, owing to its distinctive yellow color which is used to signify caution.

Effects of Good and Bad Lighting

Good lighting keeps the eyes from getting tired. Eyestrain may result in a feeling of discomfort. In more



Press Syndicate

Better Light Helps Make Better Students. A Lighting Engineer Measures Light on a Desk with a Meter.

serious cases, it may lead to headaches and even indigestion. If you read a book under too little light, your eye and body muscles become tense. This causes your whole body to tire. You blink more when you read with inadequate light, or with a light that causes glare.

Lighting is extremely important because so many people have eye defects. This is particularly true of people who use their eyes very much in doing certain jobs. And these eye defects also increase as people become older. Many experts believe that proper lighting in the school and home may help to prevent the increase of such eye defects.

Lighting also is important because it improves efficiency in work. In one particular case in a factory, the accuracy of work increased 14 per cent when the amount of light was increased from 1 to 10 foot-candles. Increasing the light from 10 to 100 foot-candles increased the accuracy another 8 per cent.

Lighting, both indoors and outdoors, is a vital factor in preventing accidents. Many years ago, safety experts concluded that from 15 to 25 per cent of our industrial accidents were caused by poor lighting conditions. Industrial plants which improved the lighting found that the number of accidents decreased. Lighting for safety is equally important in the home. Stairs in particular, both indoors and outdoors, should be well lighted to prevent persons from missing a step and falling. Many accidents are caused in this way.

Highway lighting is an important factor in lowering the number of automobile accidents. It is particularly important because automobiles travel so fast that the seeing time is very short. The drop in the accident rate is particularly noticeable when lights are installed at highway crossings and at places that are used frequently by pedestrians.

MATTHEW LUCKIESH

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(Family Life)
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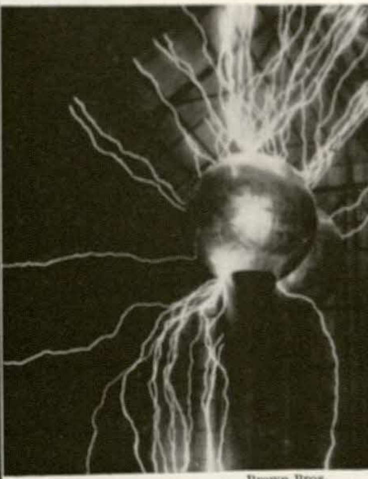
Eye
Fluorescent Lamp
Lamp
Lantern
Light
Light Meter
Neon

LIGHTNER MUSEUM OF HOBBIES. See HOBBY (Hobby Exhibits).

Charles S. Watson, U.S. Weather Bureau

LIGHTNING

Dazzling Forked Lightning flashes through the surrounding clouds and lights up the sky above the ocean. This type of lightning is deadly to swimmers or persons in small boats.



Brown Bros.

Scientists Make Lightning for study in laboratories with large generators that build up sufficient opposite electrical charges to produce an arc.

LIGHTNING is a flash of light in the sky caused by an electrical current. The current may flow between parts of the same cloud, between different clouds, or between clouds and the earth.

A Bolt of Lightning

What Causes Lightning. When a solid body becomes electrically charged, only its surface has a charge. But when a thundercloud becomes charged, the whole cloud has a charge. The cloud actually consists of an immense number of tiny water droplets. Each of these droplets has a charge on its surface. Thus a cloud may have a great electrical potential. If a cloud comes near an opposite electric charge, a huge spark may result. When a charged cloud comes near the surface of the earth, an opposite charge is induced on the surface of the earth (see INDUCTION, ELECTRIC). The air that separates the cloud and the earth acts as an insulator. It resists the efforts of the opposite charges of electricity to rush together. But when the electrical potential becomes large enough, it overcomes the resistance of the air. Then a lightning flash occurs. The flash is really a huge spark, similar to that produced in the sparkplug of an automobile. Scientists have found that one stroke of lightning measures more than 15,000,000 volts.

A spark between a cloud and the earth may measure as much as 8 miles long. It may travel at a rate of 100,000,000 feet a second. Lightning that reaches between oppositely charged clouds may have a length of 20 miles. Photographs of lightning obtained by radar indicate that some cloud-to-cloud lightning strokes may measure 100 miles long.

Lightning between clouds does not cause any damage on earth, because the electrical energy is dispersed in the air. But lightning between a cloud and the earth often causes loss of life and property. A bolt of lightning can kill a person or start a forest fire.

How Lightning Produces Thunder. As lightning travels, it heats the air in its path. The sudden heating causes the air to expand violently. The cool air farther away is pressed into a smaller space. This process starts a great air wave that results in thunder. See THUNDER.

Why Clouds Are Electrified. Meteorologists have given several explanations to account for the electrical charges on clouds. Most scientists believe that it results from the unequal sizes of the water droplets in the clouds. They believe that when water falls through a rising column of air, the larger drops break up into smaller drops of unequal size. The larger of these drops possess a positive electrical charge. The smallest drops have negative charges. Scientists have shown that this situation exists for the spray droplets in waterfalls.

Thunderclouds form at the tops of large rising air currents. The large water drops fall through the rising currents, and split when they reach a certain size. Then the drops become charged and separated. The larger drops become positively charged and continue to fall. The smaller particles retain a negative charge, and the rising air carries them upward. These particles may grow in size, and then fall and separate again. Thus, a continual process of charging takes place. The potential of a cloud may increase through these continued changes until finally, a flash of lightning occurs.

Kinds of Lightning

All lightning strokes are basically about the same. But they appear to have different forms, depending on the position of the observer.

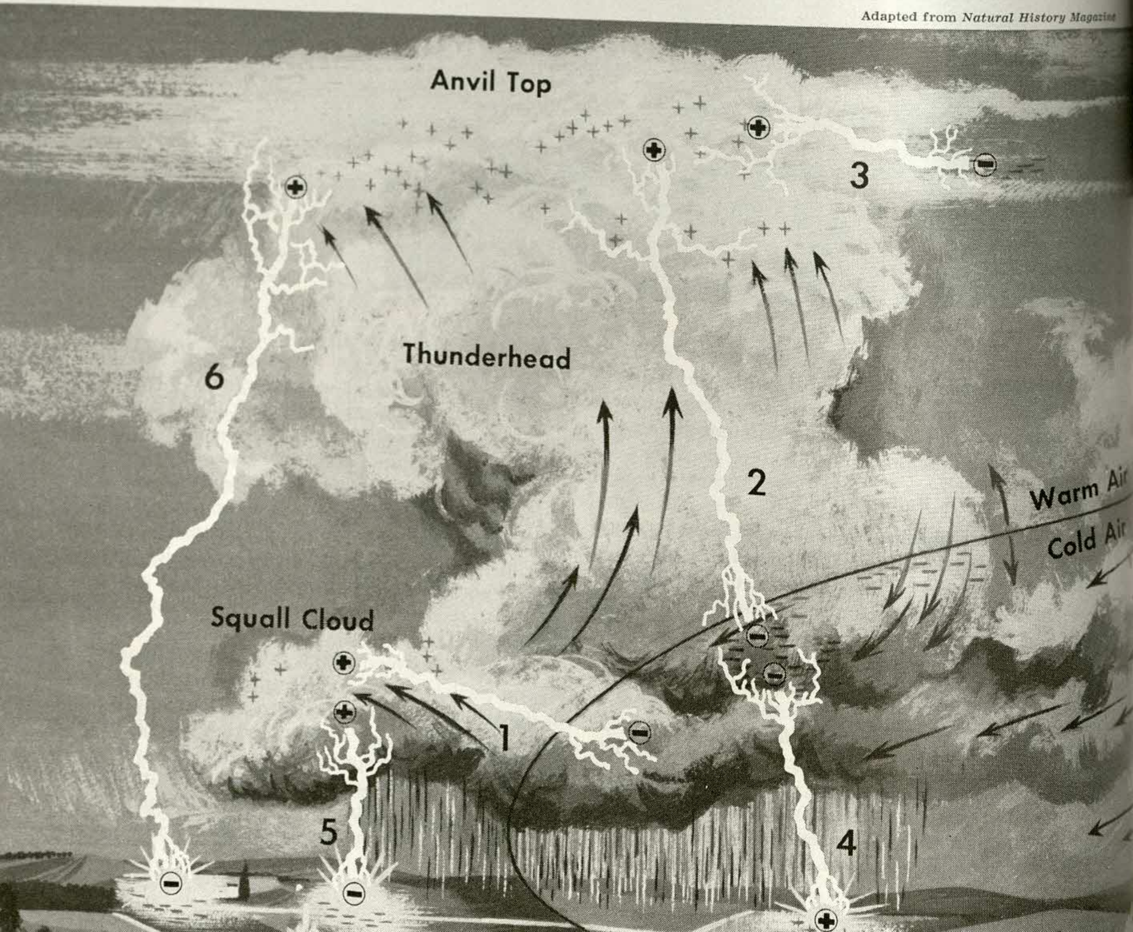
Forked, Zigzag, or Chain lightning is a chain of brilliant light that appears to zigzag. It actually follows a winding path, like that of a river. The single streak of lightning often breaks into several branches or forks.

Sheet lightning has no particular form. It is usually a bright flash that spreads all over the horizon and lights up the sky. Sheet lightning is really light from a flash of chain lightning that takes place beyond the horizon.

Heat lightning, often seen on summer evenings, is the same as sheet lightning, but the flashes are fainter. Thunder usually does not accompany them. The lightning occurs too far away for thunder to be heard.

Ball lightning seems to consist of balls of fire, as small as walnuts or as large as balloons, that last about three to five seconds. They fall swiftly from the clouds until they strike the ground and explode. Sometimes they

Flashes of Lightning take place between a positively charged area and a negatively charged area. These may be different parts of the same cloud, different clouds, or a cloud and the earth. Many scientists believe that updrafts in clouds separate the positive and negative charges. Six different kinds of lightning, numbered according to frequency of occurrence, include: (1) from front of storm to back; (2) from upper to lower clouds; (3) "glow discharge" into the surrounding air; (4) from low raincloud to the earth; (5) from "squall cloud" to the earth; and (6) from upper cloud to earth. Arrows indicate the movement of air.



Adapted from *Natural History Magazine*

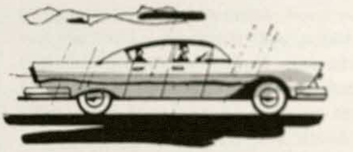
LIGHTNING SAFETY RULES

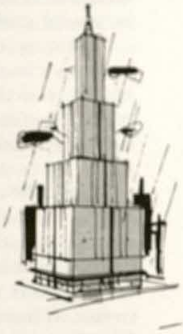
Lightning Blasts through the atmosphere at an estimated rate of 2,000,000,000 flashes a year. In the United States alone, it kills one person and injures four others every day.

United Press Int.

Forked Lightning etches a beautiful but deadly pattern across the sky.

If Caught Outdoors during a storm, lie down and stay on low ground. Do not seek shelter under a lone tree or stand atop a hill or near a lake.





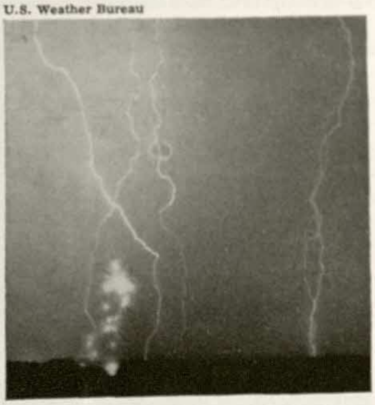
The Safest Place to be during a storm is in a closed car or a steel frame building that is equipped with lightning rods.

United Press Int.

If Indoors, avoid doorways and open windows. Do not touch plumbing fixtures, electric wiring, telephones, and radio and television sets.

Lightning Strikes the Empire State Building 30 to 48 times a year.

U.S. Weather Bureau



Ball Lightning Explodes over the ground like brilliant fireworks.

roll slowly along the ground and do not explode until they hit an obstacle. Ball lightning is the least understood of all forms of lightning. Many meteorologists even doubt that it exists. They think it may be an optical illusion. However, so many reliable witnesses have seen it, that scientists have begun to study it. They have produced ball lightning in the laboratory. This kind of lightning does not appear to be dangerous.

History

In earliest times, men looked on lightning as one of the great mysteries of nature. The ancient Romans believed that thunder and lightning were the weapons of the god Jupiter. They thought that such powerful and deadly weapons could belong only to the greatest of their gods. Modern science has shown that lightning is really a flow of electricity formed high above the earth. If a man could find a way to use the electrical current in a single lightning flash a mile long, he could light 1,000,000 light bulbs.

Benjamin Franklin showed the connection between electricity and lightning. He made a silk kite and fastened a piece of wire near its top. Then he attached a long string to the kite and tied an iron key to the free end of the string. In 1752, Franklin sent the kite up in a heavy thunderstorm. As a thundercloud came near the kite, Franklin saw the loose ends of the string stiffen. He put his hand near the key and instantly felt a shock as a spark traveled from the key to his finger. Rain then fell heavily. The wet kite carried such a large charge of electricity that some of it charged a battery in a container called a Leyden jar. Franklin's experiment was very dangerous. See Franklin, Benjamin (Experiments with Electricity); Leyden Jar.

In 1752, Franklin built the first lightning rod. This device protects homes and other buildings from damage by lightning. Franklin erected a pointed iron rod on the roof of his house, extending it five feet into the ground. A metal rod with its lower end in the moist earth and its upper end above the building will protect the building by conducting a lightning flash harmlessly to the earth.

Walter J. Saucier

See also Electricity (How to Use Electricity Safely); Lightning Rod; Saint Elmo's Fire; Thunder.

LIGHTNING BEETLE, or **BUG.** See FIREFLY.

LIGHTNING ROD is a device that protects homes and other buildings from damage by lightning. A common type has a pointed metal rod installed on top of a house or other structure. A wire or cable leads from this rod to a *ground rod* buried 10 feet or more in the earth. The ground rod should be buried at least 2 feet from the building in moist earth. It should be as straight as possible. If a building has several metal supports, each should be connected to a lightning rod and there should be several ground connections.

Lightning rods are most often used in farming regions to protect homes, barns, and windmills. They are not often seen in cities, because there is so much metal used and the buildings stand close together. Other kinds of lightning protectors are used on power stations, telephone wires, and electric structures. WALTER J. SAUCIER

LIGHTSHIP is a vessel used as a floating lighthouse. Lightships are stationed at dangerous places along coasts, at harbor entrances, and other places where lighthouses cannot be built. The modern lightship is usually made of steel and is run by a steam or diesel engine. It has two mastheads, on one of which a powerful light operates from sundown to sunrise. On the other mast is an identical light which is held in reserve. It also has a fog signal, a radio beacon, and an underwater bell. Other machines on board run the signaling devices. In peacetime about 30 lightships guard the coast of the United States. One, anchored on the dangerous Nantucket Shoals, 26 miles from Nantucket Island off the coast of New England, is farther from shore than any other lightship in the world. JOHN J. FLOHERTY

U.S. Coast Guard

The Lightship is built to survive any kind of storm. The United States Coast Guard has about 30 of these lightships anchored close to danger zones along the United States coast line. The boats carry crews of two or three men to watch over and repair the many types of warning devices. The crews are relieved and supplied regularly by the Coast Guard.

See also LIGHTHOUSE.

LIGHTWEIGHT. See BOXING (The Classes).

LIGNIN, *LIG nin*, is a complex substance formed by certain plant cells. It is one of the chief substances in wood, and therefore is important in forming the skeleton of trees. Lignin, found in the cell walls of woody tissue, is closely related to cellulose. It is made up of the same elements as cellulose, but its exact chemical composition is still unknown. Lignin, like cellulose, permits water and gases to pass through it. It turns yellow when it is treated with sulfuric acid and iodine, while cellulose turns blue. In the manufacture of paper, lignin is removed from wood by treating the wood fibers with sulfur dioxide or sodium hydroxide.

Once regarded as a waste product in paper manufacturing, some lignin is now used as fuel in paper-pulp mills. It is also used in making plastics, fertilizer, artificial vanilla, cosmetics, building board, rubber, fire extinguishers, and other items. CLARENCE J. HYLANDER

See also CELLULOSE.

LIGNITE is a brownish-black coal which contains less carbon and more moisture than commercial grades of coal. It is a soft coal. Large deposits of lignite lie in the northwestern United States and in western Canada. See also COAL (Chief Kinds of Coal); NORTH DAKOTA (Interesting Places to Visit).

LIGNUM VITAE, *LIG num VY tee*, is an extremely hard wood obtained from certain Latin-American trees. It is sometimes called *Guayacan*. In Latin, *lignum vitae* means *wood of life*. The wood from these trees was so named because its resin was used to treat rheumatism, catarrh, and skin diseases. Today the name is still a good one, since lignum vitae wood is so hard and durable that it often lasts a lifetime.

The botanical names of trees which yield lignum vitae are *Guaiacum officinale* and *Guaiacum sanctum*. These trees grow in the West Indies, Mexico, Central America, and northern South America.

The heartwood of lignum vitae is the most useful part of the tree. This wood is so heavy that it sinks in water. The wood is olive-brown, and contains an oily resin which acts as a lubricant when the wood is used for bearings. The grain of lignum vitae interlocks and makes it practically impossible for the wood to be split.

Lignum vitae is used for the stern propeller-shaft bearings in steamships, for the sheaves and blocks of pulleys, and for mallets, furniture casters, and band saw guides. A resin known as "guaiac" is extracted from the wood and used in the drug trade. ARTHUR KOEHLER

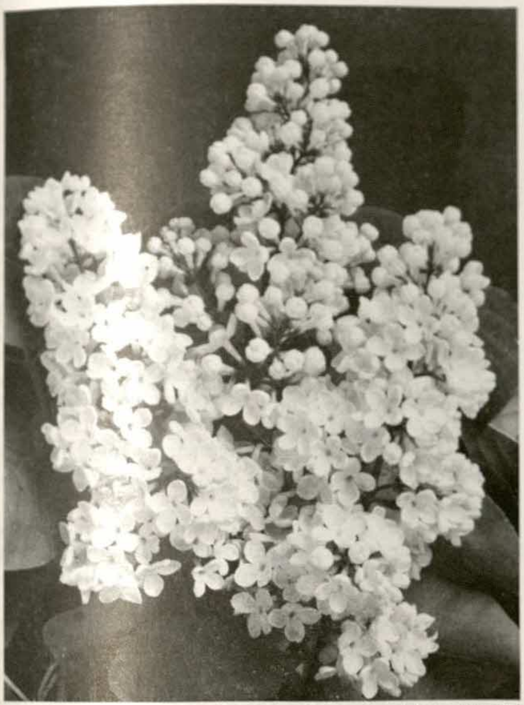
LIGUEST, PIERRE LACLÈDE. See SAINT LOUIS (History).

LIGUORI, SAINT ALPHONSUS. See ALPHONSUS LIGUORI, SAINT.

LIGURIAN SEA is the broad portion of water between the Gulf of Genoa and the Mediterranean Sea. The Italian region of Liguria lies north along this sea beyond the gulf. The island of Corsica lies to the south. For location, see ITALY (color map).

LIJ YASU. See ETHIOPIA (United).

LILAC, *LI lack*, is a shrub that is loved throughout the world for its fragrant flowers. The *common lilac* from southeastern Europe grows to a height of 20 feet, and has wide, spreading branches thick with flowers. Its green leaves are about 5 inches long. The white or purple flowers grow in clusters that may be 10 inches wide. Lilac bushes can be grown in almost any yard, and the plant needs little attention. It may be grown from seeds which are sown in early spring, or by cuttings from green lilac wood, ripe wood, or roots. Some kinds of lilac are grown by grafting or budding. In the northern states, most lilacs bloom in May. Nurseries have developed many different kinds which have larger and more colorful blossoms than the common lilac. Their



J. Horace McFarland

The Clustered Blossoms of the Lilac, one of the best-loved flowering shrubs. It is a close relative of the olive and the privet, and has four-petaled flowers like theirs.

colors vary from white to dark purple and deep red.

Lilacs can be made to bloom in the winter by keeping them under glass. The plants are put in pots in the spring and taken outdoors later in the summer. The plants bloom in three to five weeks if they are kept in a temperature between 60° F. and 80° F.

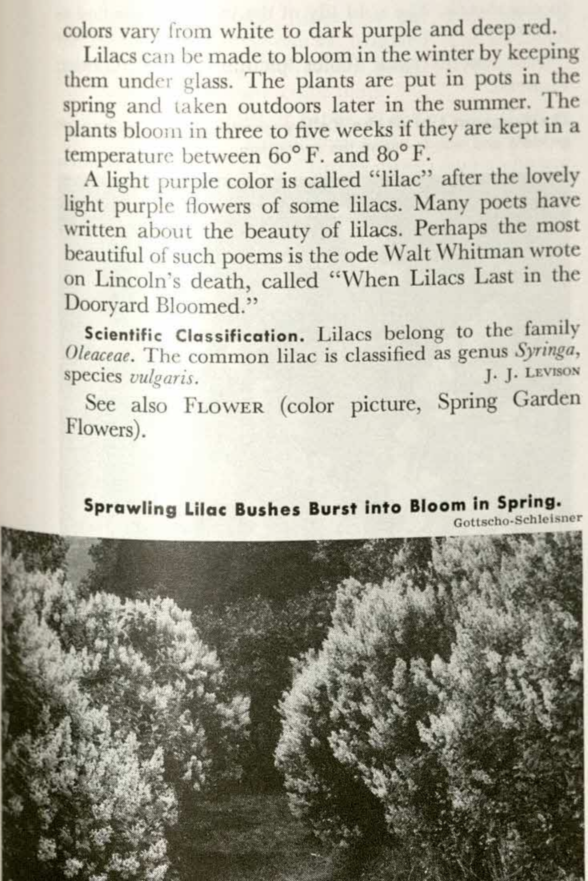
A light purple color is called "lilac" after the lovely light purple flowers of some lilacs. Many poets have written about the beauty of lilacs. Perhaps the most beautiful of such poems is the ode Walt Whitman wrote on Lincoln's death, called "When Lilacs Last in the Dooryard Bloomed."

Scientific Classification. Lilacs belong to the family *Oleaceae*. The common lilac is classified as genus *Syringa*, species *vulgaris*. J. J. Levison

See also Flower (color picture, Spring Garden Flowers).

Sprawling Lilac Bushes Burst into Bloom in Spring.

Gottscho-Schleisner



LILIENTHAL, *LIL yun thawl*, **DAVID ELI** (1899-), was the first chairman of the United States Atomic Energy Commission. He was appointed in 1946. He resigned in 1949 but continued to serve until February, 1950, at the request of President Harry S. Truman. Lilienthal also was a director of the Tennessee Valley Authority (TVA) in 1933. He served as chairman of the TVA from 1941 to 1946.

Lilienthal was born in Morton, Ill. He was graduated from DePauw University and Harvard University Law School. In 1931, he became a member of the Wisconsin Public Service Commission. F. Jay Taylor

LILIENTHAL, OTTO. See Glider (Pioneer Gliders).

LILIUOKALANI, *lee LEE woh kah LAH nee*, **LYDIA KAMEKEHA** (1838-1917), reigned as queen of Hawaii from 1891 to 1893. She became queen after the death of her brother, King David Kalakaua.

American settlers who controlled most of Hawaii's wealth revolted in 1893 when Liliuokalani tried to restore some of the monarchy's power. A republic was established in 1894, and the new government hoped the United States would annex Hawaii. But President Grover Cleveland tried instead to restore Liliuokalani to her throne. He failed, and Hawaii was annexed in 1898.

Liliuokalani made two trips to the United States after she lost her throne. She is perhaps best known today for her song, "Aloha Oe," which became the traditional farewell song of Hawaii. John A. Garraty

See also Dole, Sanford Ballard; Hawaii (History).

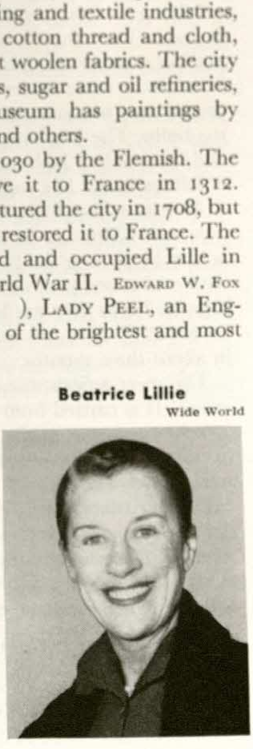
LILLE, *leel* (pop. 194,616; met. area, 760,000), a French industrial city, lies 130 miles northeast of Paris, near Belgium. For location, see France (color map). It is the center of the country's spinning and textile industries, producing vast quantities of cotton thread and cloth, and some of the world's finest woolen fabrics. The city also has great printing houses, sugar and oil refineries, and dye works. Its art museum has paintings by Rubens, Goya, Van Dyck, and others.

Lille was founded about 1030 by the Flemish. The government of Flanders gave it to France in 1312. Eugene, Prince of Savoy, captured the city in 1708, but the Peace of Utrecht in 1713 restored it to France. The armies of Germany captured and occupied Lille in World War I and again in World War II. Edward W. Fox

LILLIE, BEATRICE (1898-), Lady Peel, an English actress, won fame as one of the brightest and most natural comediennes of her time. She appeared in more than 40 shows after her first professional appearance in 1914. She became especially known for her monologue called "Double Damask Dinner Napkins." Miss Lillie was born in Toronto, Ont. As a girl, she sang with a Presbyterian church choir. But she was asked to resign because her comic antics interfered with the rehearsals of the church choir. Richard Moody

Beatrice Lillie

Wide World



LILLIPUT. See GULLIVER'S TRAVELS.

LILLO, GEORGE. See DRAMA (The English Theater).

LILY is one of the largest and most important plant families. The name is used for many garden and hothouse flowers, such as the tiger lily, the Madonna lily, the white Easter lily, and the Chinese and Japanese lilies. The lily family also includes a number of plants that are important to agriculture. These include the onion, garlic, leek, asparagus, aloe, and many others. A few flowers which do not have *lily* as part of their name, such as the hyacinth and the trillium, are also in the lily family. But the so-called calla lily and water lily are not members.

There are more than 200 genera in the lily family, with about 2,000 species. Twelve species of true lilies are native to the United States. The *meadow lily* of the southeast is reddish-orange with purple spots and grows about 5 feet tall. The *southern red lily* also grows along the southeastern coast. It is about 2 feet high with bright red and yellow flowers spotted with purple.

The tall *leopard lily* grows along the west coast from California to Oregon. It is about 8 feet high with reddish-orange flowers spotted purple. The *Sierra lily* grows in the same region. It is about 5 feet tall with brilliant red-orange flowers that are also purple-spotted.

The *wood lily* grows in the Northeastern and Middle Western states from Maine to Missouri. Its flowers are also orange-red with purple spots, and it grows to a height of 3 feet.

Lily flowers grow from scaly bulbs. They send forth bare or leafy upright stems. Most lilies have clusters of gaily nodding flowers. The blossoms are trumpet-shaped, and made up of six parts.

Lilies grow best in deep, sandy loam that is kept well drained. They should be sheltered from strong winds and hot summer sun. The bulbs of most lilies are planted 6 inches or more under the soil in late fall. They are placed deep because many of them send out roots above the bulbs. The Madonna lily is planted only in August and is set only 2 inches deep because it starts a growth of foliage in the late summer.

As soon as the plants bloom, the seed pods should be removed. Lilies can be made to bloom early in greenhouses by putting the bulbs in pots and covering them with coal ashes, peat moss, or even soil. When brought into the house they are kept at a temperature of 50° F. for about 10 days and then at 60° F. The plants bloom in about three months.

The most serious disease that attacks lilies is called *mosaic*. It is carried from plant to plant by aphids and attacks every part of the plant except the seeds. When one of the plants becomes infected, it should be removed immediately and burned. Another disease, called *botrytis blight*, also attacks lilies. It can be controlled by spraying the flowers once a week with Bordeaux mixture, a solution of copper sulfate and hydrated lime in water.

Scientific Classification. True lilies belong to the family *Liliaceae*. They form the genus *Lilium*. ALFRED C. HOTTES

Related Articles in WORLD BOOK include:

Aloe
Asparagus
Asphodel
Aspidistra
Bulb
Day Lily
Dogtooth Violet
Easter Lily
Flower (color pictures)
Fritillary
Greenbrier
Hyacinth
Leek
Lily of the Valley
Mariposa Lily
Mosaic Disease
Plant (color picture, Some Members of the Lily Family)
Sego Lily
Soap Plant
Solomon's-Seal
Squill
Star-of-Bethlehem
Tiger Lily
Trillium
Tulip
Yucca

LILY, WATER. See WATER LILY.

LILY OF THE VALLEY is a fragrant garden flower. Each blossom is shaped like a tiny bell. It grows in the Northern Hemisphere, Europe, and northern Asia. Wild lily of the valley grows in the southern Allegheny regions of North America. The lily of the valley is the *mayflower* of the Germans. It is one of the special flowers for the month of May.

The beautiful bell-shaped flowers are pure white. They hang down in a long cluster along a slender stem. The flower stalk rises from an underground stem. Each stalk usually has two wide, oblong leaves. The fruit is a red berry about $\frac{1}{4}$-inch in diameter. The plant grows well in slight shade and in deeply dug, rich soil containing leaf mold.

Lily of the valley is a perennial plant, flowering naturally in late spring. In hothouses it blooms during all seasons. Florists keep the plant frozen until they want it to flower. It also grows well outdoors, in the shade. It will grow for many years without needing to be moved. In greenhouses, it should be kept at a temperature of about 65° F. in order to bloom.

Lily of the valley is famous for its delightful fragrance. A French toilet water called *eau d'or* is made from the flowers.

Scientific Classification. Lily of the valley belongs to the lily family, *Liliaceae*. It is classified as genus *Convallaria*, species *majalis*. The wild lily of the valley is classified as *C. montana*. ALFRED C. HOTTES

See also FLOWER (color picture, Spring Garden Flowers).

The Fragrant Lily of the Valley spreads its perfume through gardens and woods during the springtime.

J. Horace McFarland

Plaza de Armas in Lima has an impressive cathedral which stands on the site of an older cathedral. Francisco Pizarro, the Spanish conqueror of Peru, laid the cornerstone for the old cathedral in 1535. The equestrian statue of Pizarro, *foreground,* was made by Marie Harriman Rumsey.

Tom Hollyman, Photo Researchers

LIMA, *LEE mah* (pop. 1,086,250; alt. 501 ft.), is the capital and largest city of Peru. During the 1600's and 1700's, Lima served as the headquarters of the Spanish government in South America. All trade between Spain and South America passed through Lima.

The city lies on the Rimac River, about eight miles inland from the Pacific Ocean, and about at the halfway point on Peru's coast line. The name *Lima* is a changed form of *Rimac*. Lima is in one of the areas of the coastal desert that can be irrigated. The sheltered port of Callao, about eight miles away, serves the city. For location, see PERU (color map).

Very little rain falls at Lima, in some years none at all. A heavy mist, called the *garúa*, hangs over the city in winter. The Peru Current gives Lima a climate that is cooler than in most cities so near the equator (see PERU CURRENT). The average temperature is about 59°F. in July and 71°F. in January.

Francisco Pizarro, the conqueror of the Inca Indians, founded Lima on Jan. 18, 1535. The Spaniards gave the city its pattern of public squares and plazas, and its streets at right angles to one another. A severe earthquake struck Lima on Oct. 28, 1746. Little of the present-day city dates from before that time.

Many important buildings face the *Plaza de Armas*, the original center of Lima. They include the cathedral, the President's Palace, and the city hall.

The University of San Marcos, founded in 1551, is the oldest university in South America. Lima has museums specializing in Indian archaeology and ethnology, and in colonial history. The National Library of Peru is in Lima.

Lima is the center of new industrial development in Peru, and one of the fastest growing cities in South America. It manufactures cigarettes, clothing, leather, and cotton and woolen textiles. C. LANGDON WHITE

See also PIZARRO.

LIMA, *LIE muh*, Ohio (pop. 51,037; alt. 875 ft.), is a trade and manufacturing center on the Ottawa River in the northwestern part of the state (see OHIO [color map]). Important Lima manufactures include aircraft engines, automobile engines, cigars, electric motors and generators, machine tools, power shovels and cranes, and steel bodies for buses and trucks. Lima's oil fields, now mostly exhausted, were considered the world's largest in the late 1890's and the early 1900's. The city now serves as an important pipeline and refining center. Lima also processes and markets farm products from the 10-county area served by the city. Lima was organized as a town in 1842. It is the seat of Allen County, and has a mayor-council government. JAMES H. RODABAUGH

LIMA BEAN is the most nutritious member of the pea family. It is high in protein value, and rich in vitamin B. This wide, flat bean first grew in tropical America. It now grows in many warm lands, especially the United States.

Like other beans, Limas are seeds that grow in pods. The large Limas often grow an inch wide and ¼ inch thick. Some varieties have large seeds and others have small seeds. Lima beans may be green or white.

Some Limas grow on vines that can be trained on poles or trellises. The pole beans are usually planted in hills, 2 to 4 feet apart. Other kinds of Limas grow on bushes.

Lima beans grow best in rich soil that does not have too much nitrogen. They need moist air and a long growing season. Limas rank as an important crop in California, where they are planted in May and ripen around September.

Scientific Classification. Lima beans are of the pea family, *Leguminosae*. They are classified as genus *Phaseolus*, species *lunatus*. ARTHUR J. PRATT

See also BEAN; VEGETABLE (Planting Table for Vegetables).

LIMBO is a place of confinement. In early Christian times, Limbo was believed to be a place on the "fringe of Hell," where the souls of good people who died before Christ were kept. After His resurrection, He brought these souls to Heaven. Unbaptized infants also were kept in Limbo, where neither the joy of Heaven nor misery prevailed. This is still the teaching of the Catholic Church. FULTON J. SHEEN and MERVIN M. DEEMS

LIMBOURG, POL DE, was the best known of three brothers who were manuscript painters. They worked in France in the 1400's for the Duke of Berry. Their most famous work is *The Duke of Berry's Book of Hours.* The book contains scenes of the life of the times, associated with each month of the year. It is distinguished by brilliant coloring and fine command of space. One scene from the book, *June*, appears in color in the PAINTING article. JOSEPH C. SLOANE

See also GOUACHE (picture).

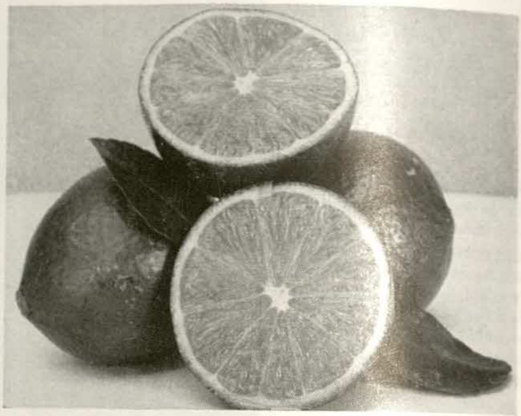
LIMBURGER. See CHEESE (Kinds of Cheese).

LIME is a rounded fruit that is pointed at both ends. It is greener than the lemon, to which it is related. It grows on a small citrus tree. The lime tree comes from India. It now grows in the Mediterranean basin, the West Indies, Mexico, Florida, and southern California. Lime trees grow well in southern Florida, where most United States limes are produced.

The lime tree rarely grows higher than 10 to 12 feet. The fruit is an important source of lime juice and oil of lime. It is often used to make a cool drink called *limeade*, which is prepared from limes the same way lemonade is made from lemons. Limes help prevent scurvy. In the 1700's British sailors carried crates of limes on their ships, and drank the juice to ward off scurvy (see SCURVY).

Calavo Growers of California

Limes Grow in Clusters on small citrus trees.



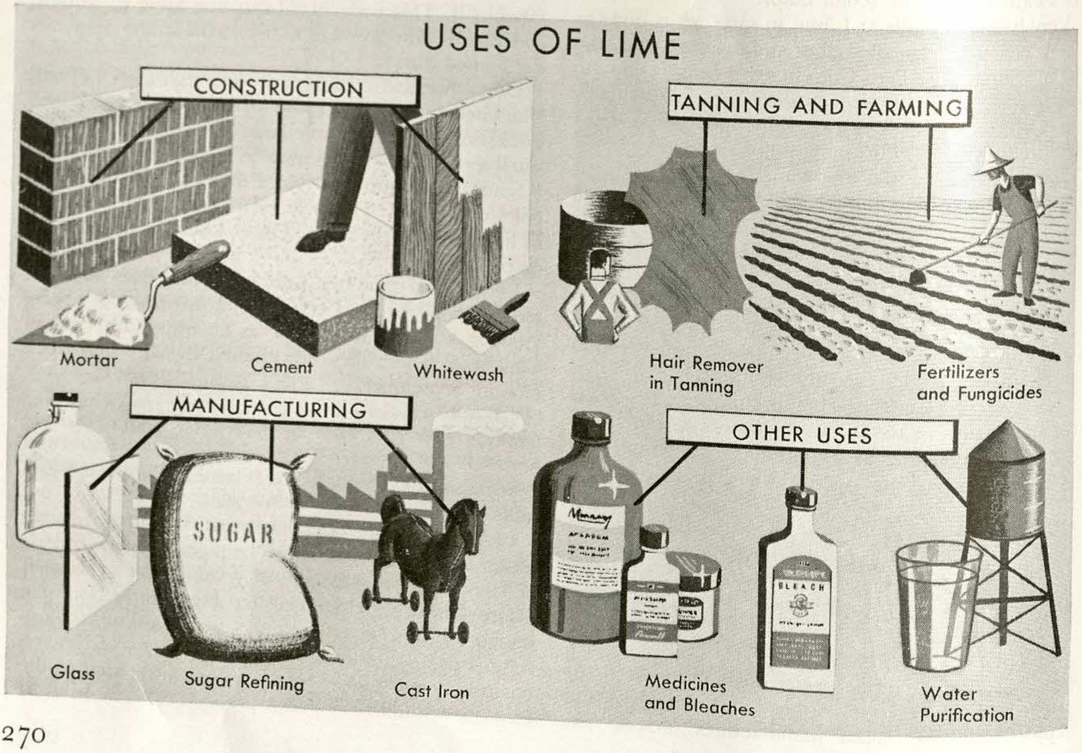
J. Horace McFarland

The Sharp, Sour Flavor of the Lime gives zest to one of the most popular summer drinks, limeade. In the days of sailing ships, English seamen ate limes to prevent scurvy. For this reason English sailors are sometimes called "limeys."

Scientific Classification. The lime tree is a member of the family *Rutaceae*. It is classified as genus *Citrus*, species *aurantifolia*. ROBERT WILLARD HODGSON

See also CITRUS.

LIME (chemical formula, CaO) is a coarse, white solid substance formed by "burning" limestone in kilns. It withstands great heat, but can be melted in an electric furnace. It is an oxide of the metal calcium. Lime is strongly alkaline and readily neutralizes acids. It also eats into vegetable and animal substances the same way that caustic soda and potash do. Lime is often used to



destroy refuse. It is sometimes called *quicklime* because of its strong action.

If water is poured on lime, the lime swells and changes into a fine powder, forming *slaked lime*, which is mostly calcium hydroxide, $Ca(OH)_2$. This process gives off enough heat to boil water. Lime also changes to powder when exposed to the air for several days. The lime absorbs water and carbon dioxide from the air and forms *air-slaked lime*.

Quicklime is usually made in huge revolving kilns heated by gas flames. Fragments of limestone are slowly poured into one end of the kiln, and the finished lime comes out the other end. A temperature of about 1800° F. is necessary to break down the limestone fragments rapidly.

Both limestone and air-slaked lime are calcium carbonate. Quicklime is calcium oxide, and water-slaked lime is calcium hydroxide. *Limewater* is a solution of water-slaked lime in water. *Milk of lime* is a mixture of limewater with undissolved slaked lime. *Hydraulic lime* hardens under water.

Lime is the cheapest of the alkalies, and is used in many of the arts. It is used to make mortar and whitewash, and in the manufacture of bleaching powder, which is a chloride of lime. Some nitrogenous fertilizers are made with the help of lime, as are cements for buildings and pavements. Lime is also used to help remove the hair from hides in tanning, and for making certain kinds of glass. Several fungicides are made with lime, and a lime mixture restores the sweetness to soil that has become sour or acid. When lime is mixed with sand and the mixture is raised to a high temperature, the lime and sand *fuse*, or melt together. They form a liquid glass that will dissolve many mineral substances. Limestone is used this way in smelting iron ore to make the iron melt more easily. GEORGE L. BUSH

See also CALCIUM; FERTILIZER (Kinds of Fertilizer); GLASS; LIMESTONE; LIMEWATER.

LIME TREE. See LINDEN.

LIMELIGHT. See OXYGEN.

LIMERICK is a popular nonsense verse of a special form. The name *limerick* is supposed to have come from the chorus of an old song in which the city of Limerick, Ireland, is mentioned. The form and meter of this chorus are used in all limericks. A limerick has five lines. The first two and the last rhyme, and the third and fourth rhyme. The third and fourth lines are shorter than the other three, as in this example:

A man from Hoboken said, "Why
Can't I sit in my lap if I try?"
He turned round and round
Till he fell to the ground
And finally gave up with a sigh.

Another example is:

There was a young man from Trevizes
Whose ears were of different sizes,
The left one was small,
And of no use at all;
With the right one he won several prizes.

LIMERICK, *LIHM ur ick* (pop. 50,820; alt. 44 ft.), is the chief port on the western coast of Ireland. It lies on both sides of the Shannon River. For location, see IRELAND (color map).

Shannon airport, 15 miles west of Limerick, is the largest in Ireland. It serves many transatlantic flights. Limerick's main industries produce canned salmon, cattle feed, clothing, cured bacon and ham, cured tobacco, dairy products, farm tools, hides, and rope. The city is divided into three parts. Kings Town, settled by Norman invaders from England in the 1100's, lies on Kings Island in the Shannon. In the 1100's, Irish Town became an Irish suburb on the mainland south of Kings Town. In the 1700's, the city expanded south of Irish Town, forming the area called Newtown-Pery. Since then, Limerick has expanded in all directions and has become the largest town on the west coast of Ireland.

Viking invaders seized Limerick in the 800's. They held the city for about 200 years until Brian Boru, an Irish king, defeated them in the 1000's. T. W. FREEMAN

See also LIMERICK (verse).

LIMERICK, TREATY OF. See BOYNE, BATTLE OF THE.

LIMESTONE is a type of rock made up mostly of calcium carbonate. It is usually a grayish color, but all colors of limestone from white to black have been found. Scientists test natural rock to see if it is limestone by pouring cold diluted hydrochloric or sulfuric acid on it. Limestone gives off bubbles of carbon dioxide.

Most fresh water and sea water contain dissolved calcium carbonate. All limestones are formed when the calcium carbonate crystallizes out of solution. It leaves the solution in many ways, and each way produces a different kind of limestone. All the different kinds can be divided into two groups.

The first group includes limestones that formed almost completely without the aid of organisms. This type of limestone is forced out of solution when the water evaporates. Such evaporation takes place in the hot lagoons of many coral reefs, and in most shallow tropical seas. In these places the high temperature causes the water on the surface to evaporate. A white "lime" mud is deposited on the bottom of the sea. This white mud slowly hardens into a light-colored limestone with a fine grain and even layers. Chalk is a limestone that remained soft.

When spring water evaporates on land, calcium carbonate forms a crust over moss, dead leaves, and the ground. It builds up a mound or terrace called *tufa*.

The second group of limestones forms by the work of

A Stone Saw Cuts into Limestone making shallow grooves. Then the stone is broken along the grooves to make building blocks.
Black Star

organisms. Many animals and some water plants draw calcium carbonate out of the water and use it to make their shells and bones. The oysters, clams, snails, corals, and sea urchins do this. When the animals die, the shells and bones are broken up by waves into shell and coral sand and mud. Many of the beaches on Pacific islands are made of such coral mud and sand. Most of the limestone layers in all parts of the earth were once shell or coral sand and mud. A limestone called *coquina*, formed of shells and coral, occurs in Florida. It is used to make roads and in building.

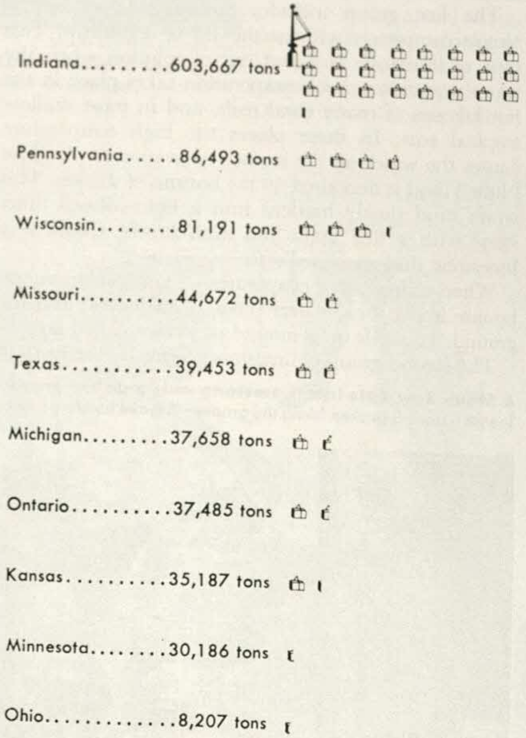
Ordinary limestone can be scratched by a knife, but it is strong. It is a good stone for foundations and walls where a high polish is not needed. It makes an excellent building stone because it can be carved easily. Like sandstone, it can be cut any way without splitting. Both resulting stones are often called *freestone*. Most building limestone in the United States comes from quarries in Indiana. Other important limestone states include Pennsylvania, Wisconsin, Missouri, and Kansas. Limestone is used in making lime, and in smelting iron ore. In iron-ore smelting, carefully measured quantities of iron ore, coke, and limestone are heated in blast furnaces. The limestone combines with the impurities i the iron ore and helps to remove them. See Iron and Steel (Limestone).

Ernest E. Wahlstro

Related Articles in World Book include:

Building Stone
Carbonate
Cement and Concrete
Chalk
Coral
Dolomite
Lime
Marble
Quarrying
Rock (Sedimentary Rock)
Stratified Rock
Travertine

LEADING LIMESTONE STATES AND CANADIAN PROVINCES



Each symbol 🏠 stands for 25,000 tons of limestone quarried each year for building purposes.

Based on yearly averages of government statistics.

LIMESTONE COLLEGE is a liberal arts college for women at Gaffney, S.C. It is a private, nondenominational school. Established in 1845, Limestone was the first women's college in South Carolina. Courses lead to the bachelor's degree. For enrollment, see Universities and Colleges (table).

LIMEWATER is a solution of slaked lime in water. Limewater was once mixed with milk as food for babies. It changes the casein in the milk to make it more digestible. The solution contains only ⅙ of 1 per cent of calcium hydroxide, but it is strongly alkaline and is used as a cheap alkali. See also Alkali; Lime.

LIMITATION OF ARMAMENT. See Disarmament.

LIMITATIONS, STATUTE OF. See Statute of Limitations.

LIMITED COMPANY is a business organization in which each shareholder is responsible only for the shares he holds. A man owning stock worth $500 will lose only his original $500 investment if the company goes into debt. Creditors cannot sue him to recover money owed by the company. In British countries, the limited company is indicated by the word *Limited (Ltd.)* following the name of the company.

L. T. Flatley

LIMNOLOGY, *lihm NAHL oh jih,* is the scientific study of lakes, streams, ponds, and other bodies of fresh water. Limnologists study the chemical and physical characteristics of these bodies of water. They also study the plants and animals that live in fresh water, and their relationship to each other and to their environment. Limnology is related to *ecology*, the study of the relations between organisms and their environments. Limnology has special importance in the management of fish for economic and recreational purposes. See also Ecology.

LIMOGES, *lee MOHZH* (pop. 105,990), stands on the Vienne River in southwestern France. For location, see France (color map). Limoges is the center of France's porcelain industry. Porcelain making has been an important industry in the city since the 1700's. Limoges also has breweries, distilleries, foundries, paper mills, printing shops, and shoe factories.

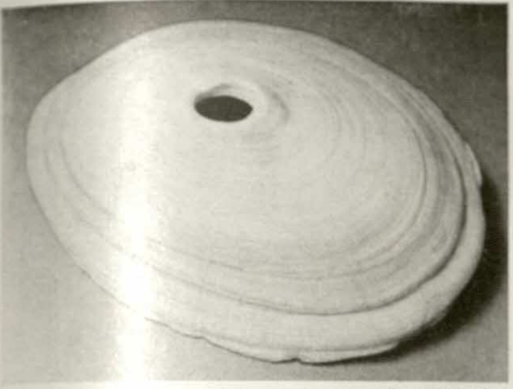
Edward W. Fox

See also Haviland China.

LIMONITE, *LIE moh nite* (chemical formula, $2Fe_2O_3 \cdot 3H_2O$), is the mineral name of natural iron oxide which contains water. Its chemical name is *ferric hydrate*. Some kinds of limonite contain more water than others, and different kinds vary in appearance. Limonite may be hard, compact, and dark brown or black, or it may be soft and yellow. When it is ground to a powder, it is always yellow. Limonite forms as a slimy deposit in lakes and marshes. It is also called *bog ore*, and was once used as a source of iron in Sweden and Norway. Brown limonite is found in Georgia, Alabama, Tennessee, and other states. The soft, yellow, earthy kinds of limonite are sometimes called *ocher*, and are used in paints and pigments. See also Mineral (color picture).

A. Pabst

LIMOUSINE. See Automobile (Kinds of Cars).



Lynwood M. Chace

The Keyhole Limpet is distinguished from the true limpets by the small hole at the top of its shell.

LIMPET is a small mollusk that lives on the rocky coasts of North and South America and Europe. It has an open shell shaped like a cone.

The limpet clings to rocks with its foot, which it uses as a sucker. When the tide is up, the limpet leaves its rock to search for food, which consists mainly of different kinds of seaweed. It gathers food into its mouth with a long tongue, or *radula*, which looks like a ribbon and is covered with rows of teeth. When the tide goes down, the limpet again attaches itself to a rocky surface.

The common European limpet is eaten in parts of Great Britain. Limpets are also used as bait. Limpets in the tropics grow to 8 inches in length.

Scientific Classification. Marine limpets belong to the families *Patellidae*, *Acmaeidae*, and *Fissurellidae*. The American limpet is classified as genus *Acmaea*, species *testudinalis;* the common European limpet is classified as genus *Patella*, species *vulgata*. William J. Clench

See also Mollusk; Snail.

LIMPOPO RIVER, *lihm POH poh,* is an important river that flows in a great half circle for about a thousand miles in southeastern Africa. For location, see Africa (color map). The Limpopo separates the Transvaal Province of the Union of South Africa from Bechuanaland and from Southern Rhodesia before it crosses Mozambique and drains into the Indian Ocean. Rudyard Kipling, the English writer, described the river in his story, "The Elephant's Child," as "the great gray-green greasy Limpopo."

The last 60 miles of the Limpopo are tidewater. Above this point, the river varies between a small trickle in the dry season and a roaring flood in the wet season. Irrigation works are confined mainly to the river's tributaries, of which the Olifants River is the most important. Hibberd V. B. Kline, Jr.

LIN YUTANG, *lin yew tahng* (1895-), a Chinese scholar and writer, helped interpret Chinese culture to the West. Two of his writings in English, *My Country and My People* (1936) and *The Importance of Living* (1937), became best sellers in the United States. His novel, *Moment in Peking* (1939), dealing with changes in China since 1900, is still widely read because of its interesting plot and fluent style. His other works in English include *The Wisdom of Confucius* (1938), *A Leaf in the Storm* (1941), *The Wisdom of China and India* (1942), *The Vigil of a Nation* (1945), *The Gay Genius: The Life and Times of Su Tungpo* (1947), *The Vermilion Gate* (1953), and *The Secret Name* (1958).

Lin was interested in Chinese language reform, and played a major role in developing a romanized system of Chinese speech sounds known as *Gwoyeu Romatzyh*. This system simplified writing the Chinese language. Lin invented a Chinese typewriter in 1946.

Lin was born in Amoy. He received a master's degree from Harvard University in 1922 and a doctor's degree from Leipzig University in 1923. He taught at the National University of Peking for several years. After serving with the Nationalist government in 1927, Lin devoted himself to writing. Shau Wing Chan

Lin Yutang

LINCOLN (pop. 70,500; alt. 90 ft.) is an English city that lies 130 miles north of London in a grain-growing region (see Great Britain [color map]). It is a center for the manufacture of machinery. Lincoln has Roman remains and a number of buildings that date from the period of the Norman kings. Its cathedral, completed in 1380 after having been wrecked by an earthquake in 1185, is one of the most beautiful churches in central England. Francis H. Herrick

LINCOLN, Nebr. (pop. 128,521; alt. 1,150 ft.), became the capital of Nebraska in 1867, when Nebraska was admitted to the Union. It is the second largest city in the state and an important educational center. Lincoln was originally called Lancaster, but was renamed to honor Abraham Lincoln.

Lincoln lies 56 miles southwest of Omaha, the original capital. For location, see Nebraska (color map). It covers an area of about 24 square miles on rolling prairie lands. The Capitol is a beautiful modern structure with a low base and a 400-foot central tower.

Cultural Life. Lincoln is the home of the University of Nebraska, Nebraska Wesleyan University, and Union College. The city has more than 1,300 acres of beautifully wooded parks, two museums, and an art gallery.

Industry and Transportation. Lincoln is an important business and industrial center, served by five railroads, two airlines, and numerous highways. Its products include motor scooters, rubber belting, electrical and telephone appliances, railroad boxcars, meat, and flour. The city dominates a large area in retailing and wholesaling, and is the home of several agencies of the federal and state governments. Lincoln Air Force Base and a United States naval air station lie nearby.

Public Services. The city's water comes from wells near the Platte River at Ashland, Nebr. Natural gas comes from Kansas and the Texas Panhandle. City-owned plants furnish light and power.

History and Government. Settlers were attracted to this area in 1856 by salt springs. The original townsite was established in 1859. A mayor-council form of government was adopted in 1937. James C. Olson

ABRAHAM LINCOLN

PIERCE
14th President
1853 — 1857

BUCHANAN
15th President
1857 — 1861

Mathew Brady, Library of Congress

JOHNSON
17th President
1865 — 1869

GRANT
18th President
1869 — 1877

A. Lincoln

16TH PRESIDENT OF THE UNITED STATES 1861-1865

LINCOLN, ABRAHAM (1809-1865), was one of the truly great men of all time. He preserved the American Union during the Civil War, and proved to the world that democracy can be a lasting form of government. Lincoln's Gettysburg Address, and many of his other speeches and writings, are classic statements of democratic beliefs and goals. In conducting a bitter war, Lincoln never became bitter himself. He showed a nobility of character which continues to grow in world-wide appeal. Lincoln was the first President elected by the Republican party. After his assassination, he was succeeded by Vice-President Andrew Johnson.

The American people knew little about Lincoln when he became President. Nothing in his past experience indicated that he could meet successfully the greatest crisis in the nation's history. He received less than 40 per cent of the popular vote. As President, Lincoln was often a careless, inefficient administrator. At times, he gave way to political pressures which he might better have resisted.

But these failings mattered little when compared with Lincoln's great merits. His outstanding asset was insight. Lincoln realized at the beginning of the Civil War that the Union must be saved. The United States was the only important democracy in the world. Lincoln knew that self-government would be proved a failure if the nation could be destroyed by a minority of its own people. He determined that the nation, and democracy, would not be destroyed.

Lincoln's second great asset was his ability to express his convictions so clearly, and with such force, that millions of his countrymen made them their own. This he did in his first and second inaugural addresses, in his annual messages to Congress, in the Gettysburg Address, and in his letters. Lincoln would have been surprised that some of his speeches came to be honored as great literature. He sought only to be understood, and to convince.

Lincoln's third great source of strength was his iron will. The Civil War had to be carried on until the Union was restored. At times, people in the North wavered in this purpose. Lincoln never doubted that in the end, right would make might, and the North would triumph. His unyielding faith in victory helped to win victory.

If the Union had not been preserved, the United States would have become two nations. Neither of these nations could have attained the prosperity and importance that the United States has today. Lincoln influenced the course of world history by his leadership of the North during the Civil War. His own life story has perhaps been just as important. He rose from humble origin to the nation's highest office. Millions of persons regard his career as proof that democracy offers all men the best hope of full and free life.

Life in the United States during Lincoln's administration revolved almost entirely around the Civil War. To raise money to fight the war, Congress levied the first income tax in the history of the country. For the first time, federal officeholders had to take an oath of loyalty to the Union. Pioneers flocked to the western frontier, and mining towns sprang up overnight. The government gave free farms to settlers, and set aside land for colleges that later became state universities.

Soldiers and civilians alike sang "The Battle Hymn of the Republic" or "Dixie." Winslow Homer's painting *Prisoners from the Front* brought him his first fame. Patriotic literature included John Greenleaf Whittier's poem "Barbara Frietchie" and Edward Everett Hale's story "The Man Without a Country." Lincoln and thousands of other Americans chuckled at the humorous writings of Artemus Ward.

Early Life

Family Background. Soon after Lincoln was nominated for the presidency, he wrote an autobiography. It began: "Abraham Lincoln was born Feb. 12, 1809, then in Hardin, now in the more recently formed county of Larue, Kentucky. His father, Thomas, & grandfather Abraham, were born in Rockingham county Virginia, whither their ancestors had come from Berks county Pennsylvania. His lineage has been traced no farther back than this."

Since Lincoln's time, his ancestry has been traced to a weaver named Samuel Lincoln who emigrated from

◀ **Lincoln's Favorite Photograph** served as the model for this painting by Allen Tupper True. The portrait is in the Huntington Library and Art Gallery in San Marino, Calif.

IMPORTANT DATES IN LINCOLN'S LIFE

1809 (Feb. 12) Born near present-day Hodgenville, Ky.
1834 Elected to the Illinois General Assembly.
1842 (Nov. 4) Married Mary Todd.
1846 Elected to the U.S. House of Representatives.
1858 Debated slavery with Stephen A. Douglas.
1860 (Nov. 6) Elected President of the United States.
1864 (Nov. 8) Re-elected President.
1865 (April 14) Shot by John Wilkes Booth.
1865 (April 15) Died in Washington, D.C.

Hingham, England, to Hingham, Mass., in 1637. This was only 17 years after the Pilgrims landed at Plymouth Rock. Samuel Lincoln founded the Lincoln family in America. The families of several of his children played important parts in Massachusetts history.

Descendants of Mordecai Lincoln, a son of Samuel, moved to New Jersey, Pennsylvania, and Virginia. One was a great-great-grandson named Abraham. This Abraham Lincoln was the grandfather of the future President. He owned a farm in the Shenandoah Valley of Virginia during the Revolutionary War. In 1782, he and his wife and five small children started over the long trail to the wilderness of Kentucky. An Indian killed him there in 1786.

One of his sons, Thomas Lincoln, became the father of the future President. In later years, the President said his father was "a wandering laboring boy, and grew up literally without education." Thomas Lincoln worked as a frontier farm hand during most of his youth. But he learned enough skill at woodworking to earn a living as a carpenter. In 1806, when he was 28 years old, he married Nancy Hanks. Nancy came from what her son described as an "undistinguished" Virginia family of humble, ordinary people. Historians know only that she was the daughter of a Lucy Hanks.

Thomas and Nancy Lincoln lived in Elizabethtown, Ky., for the first 18 months of their marriage. Their first child, Sarah, was born there in 1807. The next year, Thomas Lincoln bought a farm on the South Fork of the Nolin River, about five miles south of Elizabethtown. Abraham Lincoln was born on this farm.

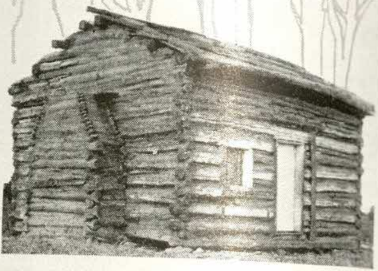
Boyhood. The Lincolns lived for two years on the farm where Abraham was born. Then they moved to a farm on Knob Creek, 10 miles away. When Sarah and Abraham could be spared from their chores, they went to a log schoolhouse. There the children learned the basic skills of reading, writing, and arithmetic.

Many persons believe that because Lincoln began his life in a log cabin, he was born in poverty. But many families lived in log cabins during the early 1800's. The Lincolns were as comfortable as most of their neighbors, and Abraham and Sarah were well fed and well clothed for the times. A third child, Thomas, died in infancy.

Thomas Lincoln had trouble over property rights throughout his years in Kentucky. In 1816, he decided to move to Indiana, where a man could buy land directly from the government. Besides, Thomas Lincoln did not believe in slavery, and Indiana had no slavery.

The Lincolns loaded their possessions into a wagon. They traveled northward to the Ohio River and were ferried across. Then they traveled through the thick forests to Spencer County, in southwestern Indiana. There, Thomas Lincoln began the task of changing 160 acres of forest land into a farm.

BOYHOOD YEARS



Brown Bros.

Lincoln's Birthplace was a log cabin near Hodgenville, Ky. The cabin at the Lincoln Birthplace Historic Site, *above*, is a replica of the one in which he was born.

Travels of the Lincolns took them to Knob Creek, Ky., in 1811, then to Indiana in 1816, and to Illinois in 1830. Lincoln moved on his own to New Salem, Ill., in 1831.

The Lincolns found life harder in Indiana than in Kentucky. They arrived early in winter, and needed shelter at once. Thomas and his son built a three-sided structure made of logs, called a "half-faced camp." A fire on the fourth side burned night and day. Soon after finishing this shelter, the boy and his father began to build a log cabin. The family moved into it in mid-February, 1817.

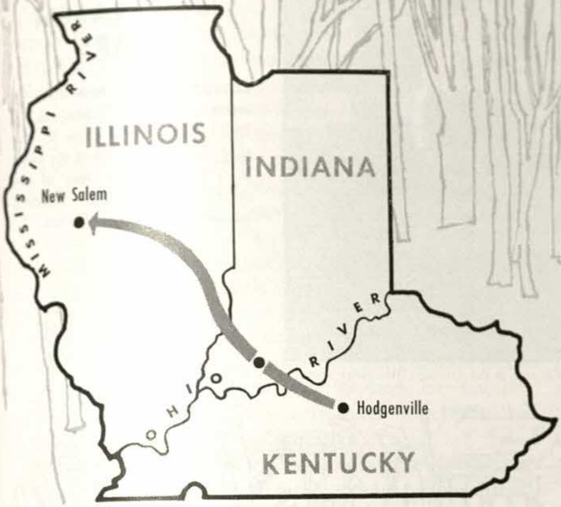
Bears and other wild animals roamed the forests of this remote region. Trees had to be cut and fields cleared so that a crop could be planted. Although Abraham was only 8, he was large for his age and had enough strength to swing an ax. For as long as he lived in Indiana, he was seldom without his ax. He later called it "that most useful instrument."

Slowly, life became happier on the farm. Then, in October, 1818, Nancy Lincoln died of what the pioneers called "milk sickness." This illness was probably caused by poison in the milk of cows that had eaten snakeroot. Thomas buried his wife among the trees on a hill near the cabin. The lack of a funeral service distressed 9-year-old Abraham. He was not content until a traveling preacher conducted a burial service over his mother's grave several months later.

The cabin became dull and cheerless after the death of Nancy Lincoln. Sarah, now 12, kept house as well as she could for more than a year. Then Thomas Lincoln returned to Kentucky for a visit. While there, on Dec. 2, 1819, he married Sarah Bush Johnston, a widow. He had known her before her first marriage. The new Mrs. Lincoln brought along her three children, aged 12, 8, and 5, and a wagonload of furniture and household goods. Her arrival at the cabin in Indiana ended the long months of loneliness. Years later, Abraham Lincoln remembered little about his own mother. He may have referred to his stepmother when he said: "God bless my mother; all that I am or ever hope to be I owe to her."

Education. Abraham Lincoln grew from a boy of 7 to a man of 21 on the wild Indiana frontier. His education can best be described in his own words:

"There were some schools, so called; but no qualification was ever required of a teacher, beyond '*readin, writin, and cipherin,*' to the Rule of Three. If a straggler



Abraham Helped Build a Cabin when the family moved to Indiana. Lincoln's mother died on this isolated frontier farm in 1818.

supposed to understand latin, happened to sojourn in the neighborhood, he was looked upon as a wizzard. There was absolutely nothing to excite ambition for education. Of course when I came of age I did not know much. Still somehow, I could read, write, and cipher to the Rule of Three; but that was all."

Lincoln's formal schooling totaled less than a year. Books could rarely be found on the frontier, and paper was almost as scarce. Like other boys and girls of his time, Lincoln made his own arithmetic textbook. Several pages of this book still exist. Abraham often worked his arithmetic problems on boards, then shaved the boards clean with a drawknife, and used them again and again. He would walk several miles for a book. The few that he could borrow were good ones. They included *Robinson Crusoe*, *Pilgrim's Progress*, *Aesop's Fables*, a history of the United States, and a schoolbook or two.

In 1823, when Abraham was 14, his parents joined the Pigeon Creek Baptist Church. There was bitter rivalry among Baptists, Methodists, Presbyterians, and members of other denominations. Young Lincoln disliked any display of bitterness among Christian people. This may explain why he never joined any church, and why he never attended church regularly. Yet he became a man of deep religious feelings. The Bible was probably the only book his parents ever owned. Abraham came to know it thoroughly. Biblical references and quotations enriched his later writings and speeches. As President, he kept a Bible on his desk and often opened it for comfort and guidance.

Another book also impressed the boy deeply, and led him to an understanding of the meaning of democracy. He told about it years later in a speech before the New Jersey Senate:

"May I be pardoned if, on this occasion, I mention that away back in my childhood, the earliest days of my being able to read, I got hold of a small book, such a one as few of the younger members have ever seen, Weems' *Life of Washington*. I remember all the accounts there given of the battle fields and struggles for the liberties of the country . . . and you all know, for you have all been boys, how these early impressions last longer than any others. I recollect thinking then, boy even though I was, that there must have been some-

Lincoln Studied by Firelight after working on the farm all day. This *diorama*, or three-dimensional scene, shows Lincoln and his parents in their log cabin on the Indiana frontier.

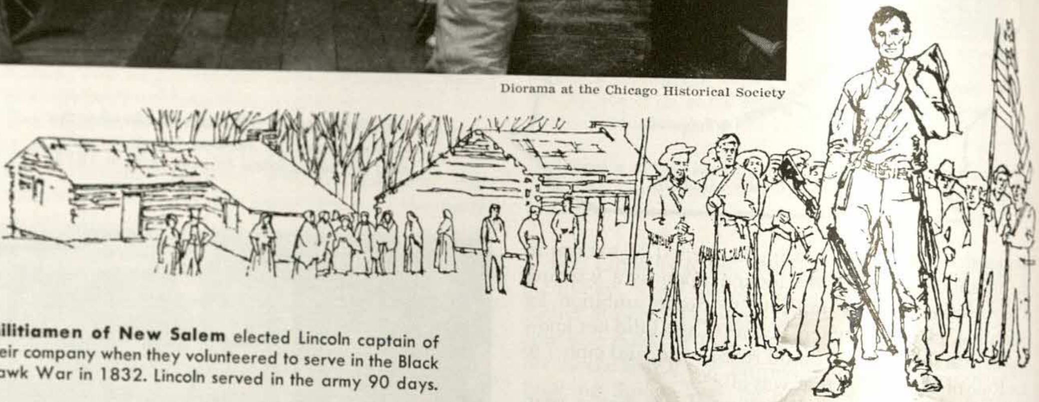
The Family Crossed into Illinois in 1830, and settled on a farm about 10 miles from Decatur. On the way, Abraham rescued a pet dog which had been trapped in an icy stream.

Dioramas at the Chicago Historical Society

NEW SALEM YEARS

Lincoln's First Job after he moved to New Salem, Ill., in 1831 was as a clerk in the store of Denton Offutt. He lived in a room at the rear of the store. Lincoln later became postmaster of New Salem.

Diorama at the Chicago Historical Society



Militiamen of New Salem elected Lincoln captain of their company when they volunteered to serve in the Black Hawk War in 1832. Lincoln served in the army 90 days.

thing more than common that those men struggled for."

Youth on the Frontier. Abraham reached his full height of 6 feet 4 inches long before he was 20. He was thin and awkward, big-boned and strong. The young man developed great strength in his chest and legs, and especially in his arms. He had a homely face and dark skin. His hair was black and coarse, and stood on end.

Even as a boy, Lincoln showed ability as a speaker. He often amused himself and others by imitating some preacher or politician who had spoken in the neighborhood. People liked to gather at the general store in the crossroads village of Gentryville. Lincoln's gift for telling stories made him a favorite with the men and boys there. In spite of his youth, he was well known in his frontier neighborhood.

A boy of Lincoln's size and strength had no trouble finding hard work. People always needed great piles of cut wood for cooking and for warmth. He could split logs for fence rails. He could plow fields, cut and husk corn, and thresh wheat with a flail. Lincoln worked for a neighbor when his father could spare him.

The Ohio River, 15 miles away, attracted Lincoln strongly. The first money he earned was for rowing passengers to a steamboat in midstream. In 1828, at the age of 19, he helped take a flatboat loaded with farm produce to New Orleans. The trip gave him his first view of the world beyond his own community. That same year, his sister died in childbirth.

In 1830, Thomas Lincoln decided to move again. The years in Indiana had not been successful. The dread milk sickness was again striking down settlers. Relatives in Illinois sent word of deep, rich, black soil on the treeless prairies. The Lincolns and several other families packed their belongings and started west. They reached their destination two weeks later, and settled 10 miles west of Decatur, on the north bank of the Sangamon River.

Lincoln was now 21, and free to strike out for himself. But he remained with his father one more year. He helped plant the first crop, and split rails for a cabin and fences. He worked for neighboring settlers during the winter. In the spring of 1831, when the streams were high, a trader named Denton Offutt hired Lincoln and two other young men to take a flatboat to New Orleans. This trip gave Offutt a good impression of his lanky boat hand. He hired Lincoln as a clerk in his new store in the village of New Salem, Ill., 20 miles northwest of Springfield. While Lincoln was away, his parents moved to Coles County, where they lived for the rest of their lives.

New Salem Years

Life on His Own began for Lincoln when he settled in New Salem. He lived there almost six years, from July, 1831, until the spring of 1837. The village consisted of log cabins clustered around a mill, a barrel-maker's shop, a wool-carding machine, and a few general stores.

The people of the village helped Lincoln in many ways. The older women mended his clothes, and often gave him meals. Jack Kelso, the village philosopher, introduced him to the writings of Shakespeare and Robert Burns. These works, and the Bible, became his favorite reading.

Lincoln arrived in New Salem, as he said, "a piece of floating driftwood." He earned little, and slept in a room at the rear of Offutt's store. Within a few months the business failed. Lincoln would have been out of a job if the Black Hawk War had not begun in 1832.

The Black Hawk War. In 1831, the federal government had moved the Sauk and Fox Indians from Illinois to Iowa. In the spring of 1832, Chief Black Hawk led a band of several hundred Indians back across the Mississippi River to try to regain their lands near Rock

Island (see BLACK HAWK). This invasion gave the settlers of Illinois a chance to rid the state of Indians forever. The governor called out the militia, and Lincoln volunteered for service.

Lincoln's company consisted of men from the New Salem area. The men promptly elected him captain. This was only nine months after he had settled in the village. Even after he had been nominated for President, Lincoln said this honor "gave me more pleasure than any I have had since." His comrades liked his friendliness, his honesty, and his skill at storytelling. They also admired his great strength and his sportsmanship in wrestling matches and other contests.

Lincoln's term of service ended after 30 days, but he re-enlisted, this time as a private. A month later, he enlisted again. He served a total of 90 days, but saw no fighting. He later recalled that he had "a good many bloody struggles with the mosquitoes."

Search for a Career. Before his military service, many of Lincoln's friends had encouraged him to become a candidate for the state legislature. Spurred by their faith, he announced his candidacy in March, 1832. The Black Hawk War prevented him from making much of a campaign. He arrived home in July, only two weeks before the election. He was defeated, but his own precinct gave him 277 of its 300 votes.

Lincoln faced the problem of making a living. He thought of studying law, but decided he could not succeed without a better education. Just then, he had a chance to buy a New Salem store on credit, in partnership with William F. Berry. Lincoln later recalled that the partnership "did nothing but get deeper and deeper in debt." The store failed after a few months.

In May, 1833, Lincoln was appointed postmaster of New Salem. Soon afterward, the county surveyor offered to make him a deputy. Lincoln knew nothing about surveying, but he prepared for the work by hard study. Odd jobs and fees from his two public offices earned him a living.

Berry died in 1835, leaving Lincoln liable for the debts of the partnership, about $1,100. It took him several years to pay these debts, but he finally did it. His integrity helped him earn the nickname "Honest Abe."

In New Salem, Lincoln knew a girl named Ann Rutledge. When she died in the summer of 1835, he grieved deeply. His sorrow gave rise to a belief that he and Ann had planned to be married. Careful study has reduced their supposed love affair to a myth. This conclusion is supported by the fact that Lincoln proposed marriage to a Kentucky girl, Mary Owens, less than 18 months later. He met her while she was visiting her sister in New Salem. The affair was not ardent on either side, and Miss Owens rejected him.

Success in Politics. In 1834, Lincoln again ran for the legislature. He had become better known by this time, and won election as a Whig (see WHIG). He served four successive two-year terms in the lower house of the Illinois General Assembly. During his first term, he met a young Democratic legislator named Stephen A. Douglas.

Lincoln quickly came to the front in the legislature. He was witty and ready in debate. His skill in party management enabled him to become the Whig floor leader at the beginning of his second term. He took a leading part in the adoption of a plan for a system of railroads and canals. This plan broke down after the Panic of 1837. Lincoln also led a successful campaign for moving the state capital from Vandalia to Springfield.

While in the legislature, Lincoln made his first public statement on slavery. In 1837, the legislature passed resolutions condemning abolition societies. These societies urged freedom for slaves. Lincoln and another legislator, Dan Stone, filed a protest. They admitted that Congress had no power to interfere with slavery in the states where it existed. They believed that "the promulgation of abolition doctrines tend rather to increase than abate its evils." Their protest arose from the fact that the legislature failed to call slavery an evil practice. Lincoln and Stone declared that "the institution of slavery is founded on both injustice and bad policy." Slavery had become an even greater issue 23 years later, when Lincoln was nominated for President. He said then that his protest in the Illinois legislature still expressed his position on slavery.

Lincoln the Lawyer

Study. In 1834, during Lincoln's second campaign for the legislature, John T. Stuart had urged him to study law. Stuart was an attorney in Springfield and a member of the legislature. Lincoln overcame his doubts about his education. He borrowed law books from Stuart and studied them. He sometimes walked 20 miles from New Salem to Springfield for books. Henry E. Dummer, Stuart's law partner, recalled:

"Sometimes he walked, but generally rode. He was the most uncouth looking young man I ever saw. He seemed to have but little to say; seemed to feel timid, with a tinge of sadness visible in the countenance, but when he did talk all this disappeared for the time and he demonstrated that he was both strong and acute. He surprised us more and more at every visit."

On Sept. 9, 1836, Lincoln received his license to practice law, although his name was not entered on the roll of attorneys until March 1, 1837. The population of New Salem had dropped by that time, and Lincoln decided to move to the new state capital. Carrying all he owned in his saddlebags, he rode into Springfield on April 15, 1837. There he became the junior partner in the law firm of Stuart and Lincoln.

In Lincoln's time, there were few law schools. Most lawyers simply "read law" in the office of an attorney. Years later, in giving advice to a law student, Lincoln explained his method of study:

"If you are resolutely determined to make a lawyer of yourself, the thing is more than half done already. It is but a small matter whether you read *with* anybody or not. I did not read with anyone. Get the books, and read and study them till you understand them in their principal features; and that is the main thing. It is of no consequence to be in a large town while you are reading. I read at New Salem, which never had three hundred people living in it. The *books*, and your *capacity* for understanding them, are just the same in all places . . . Always bear in mind that your own resolution to succeed, is more important than any other one thing."

Early Practice. Lincoln's partnership with Stuart lasted until the spring of 1841. Then he became the junior partner of Stephen T. Logan, one of the greatest lawyers who ever practiced in Illinois. This partnership ended in the fall of 1844.

Lincoln then asked William H. Herndon to become his partner. Herndon, nine years younger than Lincoln, had just received his license to practice law. Lincoln called him "Billy," but Herndon always called his partner "Mr. Lincoln." The two men never formally dissolved their law firm. More than 16 years later, Lincoln visited his old office on his last day in Springfield before leaving for Washington to be inaugurated as President. He noticed the firm's signboard at the foot of the steps and said: "Let it hang there undisturbed. Give our clients to understand that the election of a President makes no change in the firm of Lincoln and Herndon."

The practice of law in Illinois was not specialized in Lincoln's time. He tried his first case in the circuit court of Sangamon County. He practiced in the Illinois federal courts within two years after his admission to the bar. A year later, he tried the first of many cases in the state supreme court. But all the while, he also handled cases before justices of the peace. He also gave advice and opinions on many matters for small fees.

Lincoln's Family. Soon after Lincoln moved to Springfield, he met Mary Todd (Dec. 13, 1818-July 16, 1882), a lively, dark-haired Kentucky girl who lived there with a married sister. They had a stormy courtship and at one time broke their engagement. They were married on Nov. 4, 1842, when Lincoln was 33 and his bride was 23.

Mary Todd Lincoln was high-strung and socially ambitious. Lincoln tended to be moody and absent-minded. Their contrasting personalities caused friction. But their marriage was not so discordant as some writers have described it. See LINCOLN, MARY TODD.

Lincoln and his bride first lived in a Springfield boardinghouse, where they paid $4 a week. Eighteen months after his marriage, Lincoln bought the plain but comfortable frame house in which the family lived until he became President. By the time he bought the house, his first son, Robert Todd Lincoln, was 9 months old (see LINCOLN, ROBERT TODD). His second son, Edward Baker Lincoln, was born in 1846, but died four years later. William Wallace Lincoln, born in 1850, died in the White House at the age of 11. Their fourth son, Thomas Lincoln, became famous during his father's administration as "Tad." He died of typhoid fever in 1871 at the age of 18.

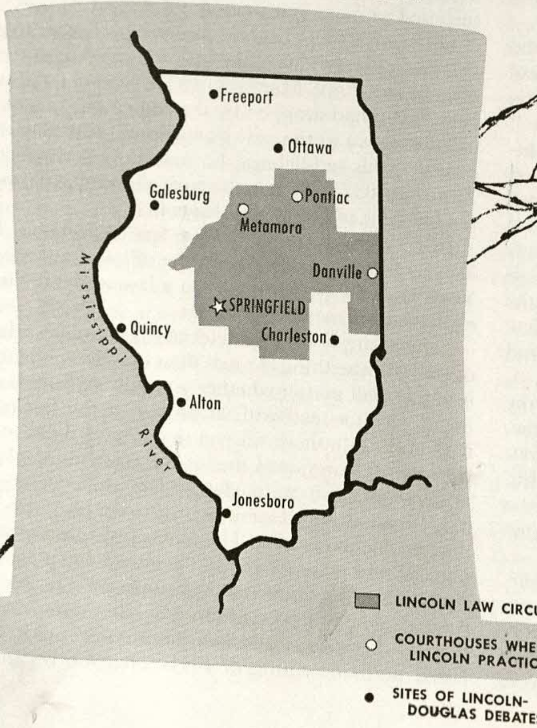
The family lived modestly but comfortably. Lincoln was never the poverty-stricken failure of legend. He often cared for his own horse and milked the family cow, but so did most of his neighbors. The family usually had a servant to help with the housework.

Riding the Circuit. The state of Illinois was, and still is, divided into circuits for judicial purposes. Each circuit consisted of several counties where court was held in turn. The judge and many lawyers traveled from county to county. They tried such cases as came their way during each term.

Lincoln "traveled the circuit" for six months each year. He loved this kind of life. The small inns where the lawyers stayed had few comforts, but they offered many opportunities for meeting people. Lively talk and storytelling appealed to Lincoln. He also liked the long rides across the prairies. Lincoln's circuit at its largest included 15 counties, and covered about 8,000 square miles.

Lincoln developed traits as a lawyer that made him

LINCOLN THE LAWYER



Lincoln, The Circuit Rider, by Reynolds Jones
Courtesy Chicago & Illinois Midland Railway Co.

Lincoln "Rode the Circuit" for six months each year. He traveled about in a buggy, taking what cases he could get at county courthouses.

well known throughout Illinois. He could argue a case strongly when convinced that his client was right. If doubtful, he was much less powerful. He persuaded clients to settle their differences out of court whenever possible. This usually meant a smaller fee, or no fee at all, for him. In court, Lincoln could present a case so that 12 jurors, often poorly educated, could not fail to understand it. He could also argue a complicated case before a well-informed judge. He prepared his cases thoroughly, and was unfailingly honest.

National Politics

Search for Advancement. After four terms in the Illinois legislature, Lincoln wanted an office with greater prestige. He had served the Whig party well, and election to Congress became his goal.

In 1840, Lincoln made a speaking tour of the state for William Henry Harrison, the Whig candidate for President. He believed his service had earned him the nomination for Congress from his district. In 1843, and again in 1844, the nomination went to other men. Disappointed, but not bitter, Lincoln worked for the election of Henry Clay, the Whig presidential candidate in 1844. Two years later, Lincoln received his reward, and won the Whig nomination for the U.S. House of Representatives. His opponent in the election was Peter Cartwright, a well-known Methodist circuit rider. The Whigs held firm control of Lincoln's district, and he received 6,340 of the 11,418 votes cast.

Congressman. Lincoln took his seat in Congress on Dec. 6, 1847. By that time, the United States had won the Mexican War, although a peace treaty had not yet been signed. Lincoln joined his fellow Whigs in blaming President James K. Polk for the war. Lincoln voted to supply equipment to troops still in the field. But his stand against the President made him unpopular with the ardently patriotic people of his district.

Lincoln failed to make the reputation he had hoped for in Congress. He gave notice that he intended to introduce a bill to free the slaves in the District of Columbia, but he never did. He emphasized his position on slavery by supporting the Wilmot Proviso, which would have banned slavery in any territory acquired from Mexico (see WILMOT PROVISO).

Throughout his term, Lincoln supported the Whig policy of having the federal government pay for internal improvements. He made several speeches in support of this policy, and once reproved President Polk for vetoing a rivers and harbors appropriation bill. Lincoln worked for the nomination and election of Zachary Taylor, the Whig candidate for President in 1848.

Return to Law. Lincoln's term ended on March 4, 1849. He wanted another term, but knew he was too unpopular to win re-election. He tried unsuccessfully to get an appointment as Commissioner of the General Land Office. The administration offered to appoint him secretary, then governor, of Oregon Territory. Lincoln refused both offers.

Lincoln returned to Springfield, believing his political career had ended. He practiced law more earnestly than ever before. He continued to travel the circuit, but appeared more often in the higher courts. He also handled more important cases. Corporations and big businesses were becoming increasingly important in Illinois and neighboring states. Lincoln represented them frequently in lawsuits, and soon prospered. The largest fee he ever received, $5,000, was for his successful defense of the Illinois Central Railroad in an important tax case. After 1849, Lincoln's reputation grew steadily. In the 1850's, he was known as one of the leading lawyers of Illinois.

Re-Entry into Politics. A sudden change in national policy toward slavery brought Lincoln back into politics. The Missouri Compromise of 1820 had prohibited slavery in new territories north of an east-west line that was an extension of Missouri's southern boundary (see MISSOURI COMPROMISE). Early in 1854, Senator Stephen A. Douglas of Illinois introduced a bill to organize the territories of Kansas and Nebraska. As approved by Congress, this Kansas-Nebraska Act repealed the Missouri Compromise. It provided that the settlers of new territories should decide for themselves whether they wanted slavery. See KANSAS-NEBRASKA ACT.

Lincoln and many others had believed that slavery had been permanently limited. The new policy outraged them. The Founding Fathers had written a promise of freedom and equality into the Declaration of Independence. Lincoln believed they had intended to keep slavery from spreading so it would one day die.

Lincoln revered the Founding Fathers. He once said: "I have never had a thought politically which did not spring from the sentiments embodied in the Declaration of Independence." Henry Clay had been his political idol during his years as a Whig politician, but he looked to Thomas Jefferson for his political principles.

Lincoln always opposed slavery, but he never became an abolitionist. He believed that the bonds holding the nation together would be strained if Americans made a rapid break with the past. Lincoln granted that slavery should have the protection that the Constitution gave it. But he wanted the people to realize that slavery was evil, and should not spread.

Douglas refused to admit that slavery was wrong. He said he did not care whether slavery was morally right or wrong. Lincoln believed that the nation stood for freedom and equality. He felt it must not be indifferent to the unjust treatment of any person. To ignore moral values, he said, "deprives our republican example of its just influence in the world." It enabled the enemies of free institutions "to taunt us as hypocrites." Lincoln resolved to return to politics and do what he could to reverse the Kansas-Nebraska Act.

A Turning Point in Lincoln's life came with his return to politics. He had always been honest, able, and ambitious. But he had worked mainly in the interest of his party and for personal advancement. After passage of the Kansas-Nebraska Act, Lincoln's aims became broader. He worked to make the nation's ideals come true. His ambitions remained, but he directed them to a higher purpose. He had always been a clever and forceful speaker. Now, a new sincerity and deep conviction lent even greater power to his words.

Lincoln entered the congressional election campaign of 1854 to help a candidate who opposed the Kansas-Nebraska Act. But when Senator Douglas returned to Illinois to justify the new law, Lincoln opposed him wherever he could. At Springfield, Peoria, and Chicago, Lincoln delivered such powerful speeches that he became known as the leader of the Illinois forces opposing the Kansas-Nebraska Act. He was again elected to the Illinois legislature, but resigned in order to run for the United States Senate.

At that time, the legislature elected Senators. On the first ballot, Lincoln received 45 votes, which was 5 short of a majority. On each succeeding ballot, his vote dwindled. Finally, to keep a Douglas supporter from being elected, Lincoln persuaded his followers to vote for Lyman Trumbull, who had started with only 5 votes. Trumbull was elected.

The Whig party began falling apart during the 1850's because party members in various parts of the country could not agree on a solution to the slavery problem. In 1856, Lincoln joined the antislavery Republican party, then only two years old. During the presidential election campaign that year, he made more than a hundred speeches in behalf of John C. Frémont, the Republican candidate. Frémont lost the election to Democrat James Buchanan. But Lincoln had strengthened his own position in the party through his unselfish work.

The Debates with Douglas. In 1858, Lincoln was nominated to run against Douglas for the United States Senate. He accepted the honor with a speech that caused severe criticism. Many persons thought it stirred up conflict between the North and South. Lincoln said:

"A house divided against itself cannot stand. I believe this government cannot endure, permanently half *slave* and half *free*. I do not expect the Union to be *dissolved*—I do not expect the house to *fall*—but I *do* expect it will cease to be divided. It will become *all* one thing, or *all* the other. Either the *opponents* of slavery will arrest the further spread of it, and place it where the public mind shall rest in the belief that it is in the course of ultimate extinction; or its *advocates* will push it forward till it shall become alike lawful in *all* the States—*old* as well as *new*, *North* as well as *South*."

After a few speeches, Lincoln challenged Douglas to a series of debates. Douglas accepted, and named seven places for the meetings. The first debate was held at Ottawa, Ill., on Aug. 21, 1858. The last was at Alton, Ill., on October 15. Each candidate spoke for an hour and a half. Large crowds attended, except at Jonesboro, in the southernmost part of the state. Newspapers reported the debates, and the two men drew national attention.

The debates centered on the extension of slavery into free territory. Douglas defended the policy of the Kansas-Nebraska Act. He called this policy *popular sovereignty*. His opponents ridiculed it as *squatter sovereignty* (see SQUATTER SOVEREIGNTY). Lincoln argued that the Supreme Court of the United States, in the Dred Scott decision, had opened the way for slavery to enter all the territories (see DRED SCOTT DECISION). In the debate held at Freeport, Ill., Douglas denied this argument. He contended that the people of any territory could keep slavery out of that territory simply by refusing to pass local laws protecting it. This position became known as the *Freeport Doctrine*. Lincoln emphasized the moral issue throughout the campaign. He insisted that there was a fundamental difference between Douglas and himself. Douglas ignored the moral question of slavery, but Lincoln regarded slavery "as a moral, social, and political evil."

In addition to the debates, both men spoke almost daily to meetings of their own. Each traveled thousands of miles. Before the exhausting campaign ended, Douglas' deep bass voice had become so husky that it was hard to understand him. Lincoln's high, penetrating voice still reached the limits of a large audience.

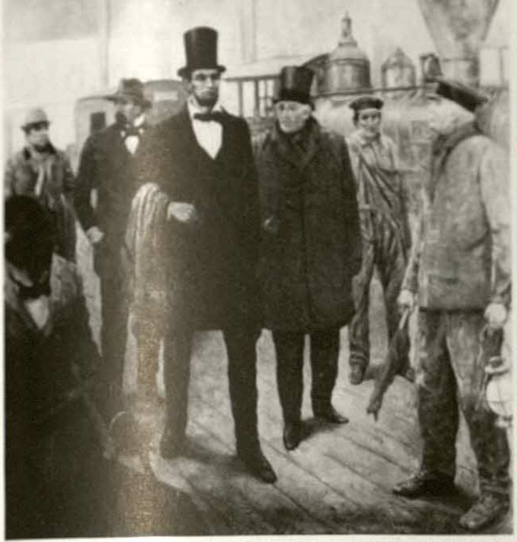
In the election, Lincoln candidates for the legislature received more votes than their opponents. But the state was divided into districts in such a way that Douglas men won a majority of the seats. As a result, Douglas was re-elected by a vote of 54 to 46.

The debates made Lincoln a national figure. Early in 1860, he delivered an address at Cooper Union in New York City. The speech ended with the famous plea: "Let us have faith that right makes might, and in that faith let us to the end dare to do our duty as we understand it." This address and others delivered later in New England made a strong impression on many influential eastern Republicans.

Election of 1860. The Republican national convention met in Chicago on May 16, 1860. Lincoln was by no means unknown to the delegates. The week before, at the Illinois state Republican convention, his supporters had nicknamed him "the Railsplitter." This nickname, recalling the days when Lincoln had split rails for fences, helped make him even better known to the delegates. But other party leaders had larger followings. Senator William H. Seward of New York had the strongest support, but he also had many enemies. Senator Salmon P. Chase of Ohio lacked the united support of even his own state. Lincoln had never held a prominent national office, and had no bitter enemies. He held moderate views on the slavery question. His humble

Diorama at the Chicago Historical Society

Lincoln-Douglas Debates were held in 1858 in seven Illinois cities. Lincoln was running against Stephen A. Douglas for the U.S. Senate. The two men debated the extension of slavery into free territory.



Painting by Herbert D. Stitt; Courtesy National Park Service

President-Elect Lincoln arrived in Washington, D.C., secretly. He had cut short a tour of eastern cities because detective Alan Pinkerton, *left*, learned of an assassination plot.

background could be counted on to arouse great enthusiasm among the voters.

On the first ballot, Seward received 173½ votes, Lincoln 102, and Chase 49. Lincoln gained the support of Pennsylvania and Indiana on the second ballot, and received 181 votes to 184½ for Seward. During the third ballot, Lincoln continued to gain strength. Before the result was announced, Ohio switched four votes from Chase to Lincoln. This gave Lincoln more than the 233 votes needed to win the nomination. The delegates nominated Senator Hannibal Hamlin of Maine for Vice-President.

Like other presidential candidates of his period, Lincoln felt it was undignified to campaign actively. He stayed quietly in Springfield during the election campaign. His followers more than made up for his inactivity. The Democratic party broke into two factions, which helped Lincoln immensely. Senator Douglas, the nation's leading Democrat, had angered the proslavery wing of his party. Northern Democrats nominated him for President. The Southern faction of the Democratic party chose Vice-President John C. Breckinridge. A fourth party, calling itself the Constitutional Union party, nominated former Senator John Bell of Tennessee.

LINCOLN'S FIRST ELECTION

Place of Nominating Convention	Chicago
Ballot on Which Nominated	3rd
Northern Democratic Opponent	Stephen A. Douglas
Southern Democratic Opponent	John C. Breckinridge
Constitutional Union Opponent	John Bell
Electoral Vote	180 (Lincoln) to: 72 (Breckinridge) 39 (Bell) 12 (Douglas)
Popular Vote	1,865,593 (Lincoln) to: 1,382,713 (Douglas) 848,356 (Breckinridge) 592,906 (Bell)
Age at Inauguration	52

Lincoln won election easily, receiving 180 electoral votes to 72 for Breckinridge, 39 for Bell, and 12 for Douglas. But more Americans voted against Lincoln than for him. The people gave him 1,865,593 votes, compared to a combined total of 2,823,975 for his opponents. All Lincoln's electoral votes, and nearly all his popular votes, came from the North.

Lincoln's Administration (1861-1865)

The South Secedes. Events moved swiftly in the South during the months before Lincoln's inauguration. Many Southern leaders had threatened to withdraw their states from the Union if Lincoln should win the election. On Dec. 20, 1860, South Carolina passed an Ordinance of Secession that declared the Union dissolved as far as that state was concerned. By the time Lincoln became President, six other Southern States had seceded. Four more followed later. The seceded states organized themselves into the Confederate States of America. See CONFEDERATE STATES OF AMERICA.

First Inauguration. Lincoln said farewell to his Springfield neighbors on Feb. 11, 1861. He parted with these words: "Here I have lived a quarter of a century, and have passed from a young to an old man. Here my children have been born, and one is buried. I now leave, not knowing when, or whether ever, I may return, with a task before me greater than that which rested upon Washington. Without the assistance of that Divine Being who ever attended him, I cannot succeed. With that assistance I cannot fail."

The long train trip to Washington, D.C., had been carefully planned to include stops at most large Eastern cities. This allowed many thousands of persons to see the man who would be their next President. In Harrisburg, Pa., Lincoln heard reports of an assassination plot. His advisers persuaded him to cut short his trip. Lincoln continued in secret to Washington, arriving early on the morning of February 23.

HIGHLIGHTS OF LINCOLN'S ADMINISTRATION

1861 (April 12) The Civil War began.
1861 (April 27) Lincoln proclaimed a blockade of Southern ports.
1861 (July 21) Confederate forces won the first Battle of Bull Run.
1862 (April 6-7) Union troops won the Battle of Shiloh.
1862 (April 16) Congress abolished slavery in the District of Columbia.
1862 (May 20) Congress approved the Homestead Act.
1862 (Sept. 17) Union forces won the Battle of Antietam.
1862 (Sept. 22) Lincoln issued a preliminary proclamation of emancipation.
1862 (Dec. 13) The Union suffered a terrible defeat at Fredericksburg.
1863 (Jan. 1) Lincoln issued the Emancipation Proclamation.
1863 (July 1-3) Union armies won the Battle of Gettysburg.
1863 (July 4) Vicksburg, Miss., fell to Union forces.
1863 (Nov. 19) Lincoln delivered the Gettysburg Address.
1864 (March 9) Grant took command of all Union armies.
1864 (Sept. 2) Sherman's army captured Atlanta, Ga.
1865 (April 9) The Civil War ended.

On March 4, 1861, Lincoln took the oath of office and became the 16th President of the United States. In his inaugural address, Lincoln denied that he had any intention of interfering with slavery in states where the Constitution protected it. He urged the preservation of the Union. Lincoln warned that he would use the full power of the nation to "hold, occupy, and possess" the "property and places" belonging to the federal government. By "property and places," he meant forts, arsenals, and customhouses. Lincoln's closing passage had great beauty and literary power. He appealed to "the mystic chords of memory, stretching from every battlefield and patriot grave to every living heart and hearthstone all over this broad land."

Lincoln announced his Cabinet the day after his inauguration. Two members, William H. Seward and Salmon P. Chase, had been his principal rivals for the presidential nomination. The men who made up the Cabinet represented many shades of opinion. Several of them administered their departments ably. But, as a group, they often gave Lincoln almost as much trouble as help.

Fort Sumter and War. As the Southern States seceded, they seized most of the federal forts within their boundaries. Lincoln had to decide whether the remaining forts should be strengthened. He also had to decide whether to try to retake the forts already in Southern hands.

Fort Sumter, in Charleston Harbor, became a symbol of an indivisible Union. Major Robert Anderson commanded the Union garrison there. If Lincoln withdrew the troops, a storm of protest would rise in the North. If he reinforced Fort Sumter, the South would consider it an act of war.

As a compromise, Lincoln decided to send only provisions to Anderson, whose supplies were running low. He informed South Carolina of his intention. Leaders of the state regarded the relief expedition as a hostile act, and demanded Anderson's surrender. Anderson refused, and on April 12, General Pierre G. T. Beauregard ordered Confederate artillery to open fire on the fort. Anderson surrendered the next day. The Civil War began with the bombardment of Fort Sumter. The military events of the war are described in the article CIVIL WAR.

Lincoln met the crisis with energetic action. He called out the militia to suppress the "insurrection." He proclaimed a blockade of Southern ports, and expanded the army beyond the limit set by law. Southern sympathizers living in the North were obstructing the war effort. As a result, Lincoln gave the army the right to suspend the privilege of *habeas corpus* in areas where these Southern sympathizers were active (see HABEAS

LINCOLN'S CABINET

Secretary of State	*William H. Seward
Secretary of the Treasury	*Salmon P. Chase †William P. Fessenden (1864) Hugh McCulloch (1865)
Secretary of War	Simon Cameron *Edwin M. Stanton (1862)
Attorney General	Edward Bates James Speed (1864)
Postmaster General	*Montgomery Blair William Dennison (1864)
Secretary of the Navy	*Gideon Welles
Secretary of the Interior	Caleb B. Smith John P. Usher (1863)

* Has a separate biography in WORLD BOOK.
† See the article MAINE (Famous Maine Men and Women).

THE WORLD OF

WORLD EVENTS

- **1861** A gold rush to New Zealand began.
- **1861** French troops invaded Mexico.
- **1862** Bismarck became prime minister of Prussia.
- **1863** The world's first successful subway was built in London.
- **1864** Napoleon III made Maximilian of Austria the Emperor of Mexico.
- **1865** Russia captured Tashkent, and all Turkestan fell under Russian rule.

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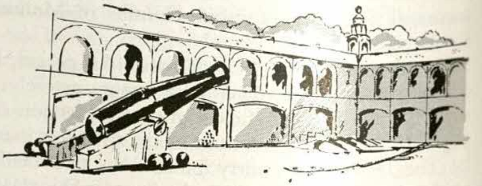
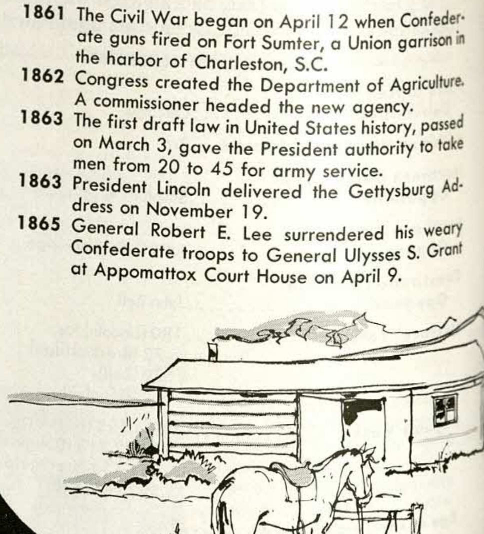
UNITED STATES EVENTS

U.S. population was 32,351,000 in 1861. Eleven Southern States, with over 9,000,000 persons, seceded from the Union. West Virginia became a state in 1863, and Nevada in 1864. Congress created the Arizona and Idaho territories in 1863, and the Montana Territory in 1864.

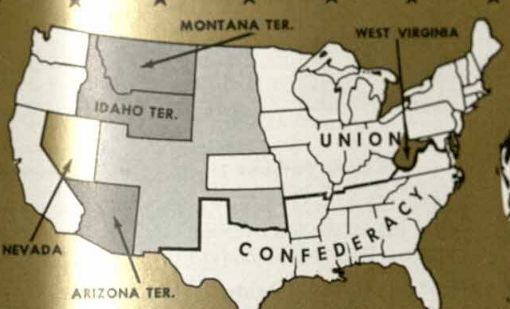
The United States Flag had 33 stars and 13 stripes when Lincoln became President.



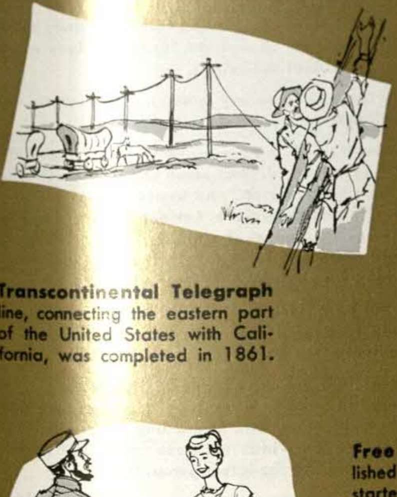
- **1861** The Civil War began on April 12 when Confederate guns fired on Fort Sumter, a Union garrison in the harbor of Charleston, S.C.
- **1862** Congress created the Department of Agriculture. A commissioner headed the new agency.
- **1863** The first draft law in United States history, passed on March 3, gave the President authority to take men from 20 to 45 for army service.
- **1863** President Lincoln delivered the Gettysburg Address on November 19.
- **1865** General Robert E. Lee surrendered his weary Confederate troops to General Ulysses S. Grant at Appomattox Court House on April 9.



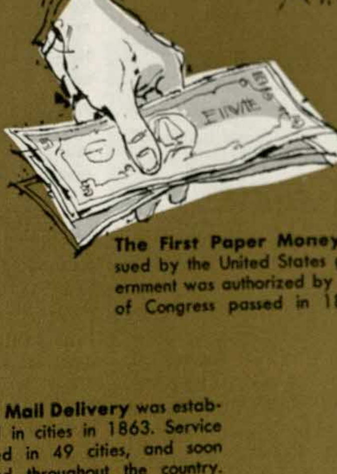
PRESIDENT LINCOLN



Civil War began a month after Lincoln became President. More than 600,000 Americans died during the four-year conflict.

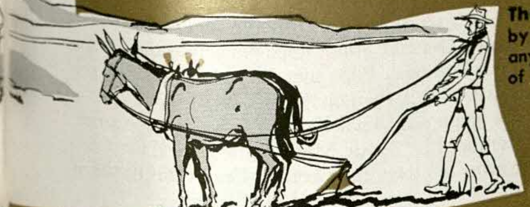


Transcontinental Telegraph line, connecting the eastern part of the United States with California, was completed in 1861.



The First Paper Money issued by the United States government was authorized by acts of Congress passed in 1861.

Free Mail Delivery was established in cities in 1863. Service started in 49 cities, and soon spread throughout the country.



The Homestead Act, passed by Congress in 1862, allowed any settler to obtain 160 acres of public land without charge.

The Emancipation Proclamation, issued by President Lincoln on Jan. 1, 1863, declared slaves to be free in the states that were still in rebellion.

America's Independent Electric Light and Power Companies

REMINDERS OF

Statues of Lincoln stand in cities and towns throughout America. Sculptor Gutzon Borglum designed this striking monument, which stands in front of the county courthouse in Newark, N.J.

Corpus). He also ordered the spending of federal funds without waiting for congressional appropriations.

Lincoln believed all these actions to be within the war powers granted the President by the Constitution. He justified his acts when Congress met for the first time in his administration in July, 1861. The message Lincoln delivered to Congress ranks as one of his greatest state papers. Chief Justice Roger B. Taney had attacked Lincoln bitterly for suspending habeas corpus. In his message, Lincoln posed a question that no critic then or afterward ever answered: "Are all the laws *but one* to go unexecuted, and the government itself go to pieces lest that one be violated?"

Lincoln felt that the breakup of the American nation would be a tragedy. Not only Americans, but ultimately all mankind, would suffer. To him, the United States represented an experiment in the people's ability to govern themselves. This experiment could become the way of life for all the world. If it failed, kings, dictators, and their supporters could say that people were not capable of ruling themselves, and that someone must rule them. Lincoln regarded the fate of world democracy as the central issue of the Civil War.

Building the Army. Two days after Fort Sumter fell, Lincoln called for 75,000 men for the army. The North offered far more volunteers than the government could equip. By July, 1861, an army had been assembled near Washington. An equal force of Confederates had taken position across the Potomac River in Virginia.

Many Northerners clamored for action. They believed the Union forces could end the war by defeating the Confederates in one battle. Newspaper headlines blazed with the cry "On to Richmond!" The administration yielded to these pressures. Lincoln ordered the Northern army forward under General Irvin McDowell. The result was the first Battle of Bull Run on July 21, in which Confederate forces decisively defeated the Union troops. People in the North now realized that the war would be a long one.

As commander in chief of the army, Lincoln had to select an officer capable of organizing green volunteers into armies and leading them to victory. General George B. McClellan turned out to be a fine organizer. But his Peninsular Campaign of 1862 ended in failure. This campaign had been aimed at capturing Richmond, Va., the Confederate capital. Lincoln relieved McClellan, and put General John Pope in command of the Army of the Potomac. Pope met disastrous defeat in the second Battle of Bull Run on August 29-30, 1862.

Some Famous Lincoln Quotations

Many of Lincoln's most famous quotations are included in the text of this article. Following are several additional quotations from speeches and letters.

Stand with anybody that stands right. Stand with him while he is right and part with him when he goes wrong.

The legitimate object of government, is to do for a community of people, whatever they need to have done, but cannot do, at all, or cannot so well do, for themselves—in their separate and individual capacities.

Nothing new here, except my marrying, which to me, is matter of profound wonder.

Property is the fruit of labor—property is desirable—is a positive good in the world. That some should be rich, shows that others may become rich, and hence is just encouragement to industry and enterprize. Let not him who is houseless pull down the house of another; but let him labor diligently and build one for himself, thus by example assuring that his own shall be safe from violence when built.

As I would not be a *slave*, so I would not be a *master*. This expresses my idea of democracy. Whatever differs from this, to the extent of the difference, is no democracy.

Fellow-citizens, we cannot escape history. We . . . will be remembered in spite of ourselves. No personal significance, or insignificance, can spare one or another of us. The fiery trial through which we pass, will light us down, in honor or dishonor, to the latest generation.

If we do not make common cause to save the good old ship of the Union on this voyage, nobody will have a chance to pilot her on another voyage.

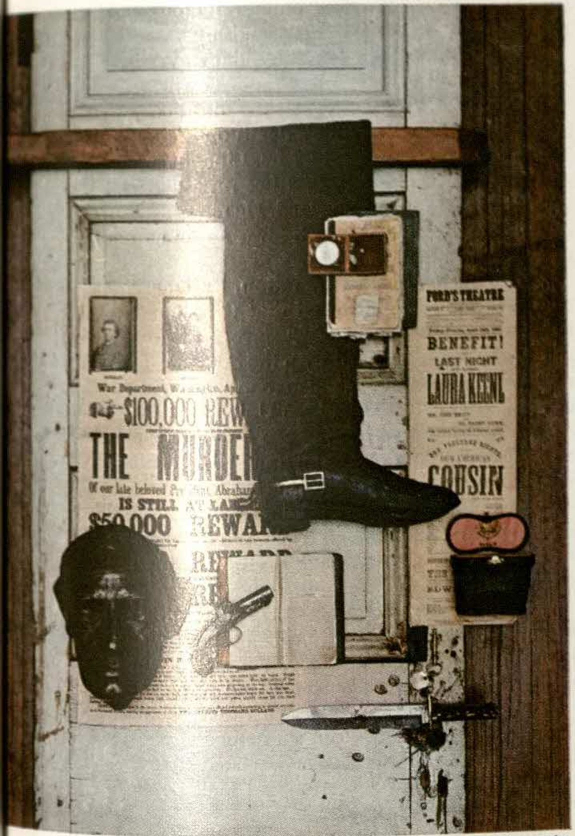
The dogmas of the quiet past, are inadequate to the stormy present. The occasion is piled high with difficulty, and we must rise with the occasion. As our case is new, so we must think anew, and act anew.

Lincoln again put McClellan at the head of the army. On September 17, "Little Mac" turned back the Confederate army of General Robert E. Lee in the Battle of

ABRAHAM LINCOLN

Lincoln the "Railsplitter." He got this nickname in the campaign of 1860. Many paintings, such as this one by an unknown artist, showed him splitting fence rails.

Mementos of Lincoln's Assassination may be seen at Ford's Theatre in Washington, D.C. They are mounted on the door through which John Wilkes Booth entered the presidential box. The items include Mrs. Lincoln's opera-glass case, a playbill, the pistol that fired the fatal shot, a boot worn by Booth, and a poster offering a reward for the capture of the assassin.



By Arnold Newman. Reprinted by special permission from *Holiday*. © 1954 Curtis Publishing Co.

Lincoln at Ford's Theatre. This diorama shows Lincoln in his box watching a play just before his assassination. John Wilkes Booth entered the box through the door behind Lincoln, *left*.

Diorama at the Chicago Historical Society

Chicago Historical Society

Carl Sandburg, *left*, and many other outstanding historians and writers have honored Lincoln in their works.

Wide World

Lincoln's Tomb stands in the Oak Ridge Cemetery at Springfield, Ill. Thousands of persons visit the tomb each year.

Herbert Georg Studio

Antietam. Then McClellan refused to move. In early November, Lincoln removed him for the second time, and put General Ambrose E. Burnside in command. Burnside met defeat in the Battle of Fredericksburg on December 13. His successor, General Joseph Hooker, lost the Battle of Chancellorsville on May 1-4, 1863.

Union forces made progress only in the valley of the Mississippi River. There, General Ulysses S. Grant was making a habit of victory. In 1862, Grant's troops won three battles: Fort Henry on February 6, Fort Donelson on February 16, and Shiloh on April 6-7.

Strengthening the Home Front. Organization for military success was only one of Lincoln's tasks. Equally important, he had to arouse popular support for the Union armies. Different opinions among the people became plain after their first enthusiasm wore off. Many Northerners were willing to fight to preserve the Union, but not to destroy slavery. Other Northerners demanded that the destruction of slavery should be put above all other goals.

Lincoln realized that the border states would secede if the antislavery extremists had their way. This would mean the loss of Kentucky, Missouri, Delaware, and Maryland. The task of defeating the South would be much more difficult without the support of these states. Besides, the Constitution protected slavery in the states where it existed. Impulsive generals sometimes issued proclamations freeing slaves, but Lincoln overruled them. Time after time, he declared that the purpose of the war was to preserve the Union. His most famous statement was made in a letter to Horace Greeley, editor of the *New York Tribune*. In the letter, dated Aug. 22, 1862, Lincoln said: "My paramount object in this struggle is to save the Union, and is not either to save or to destroy slavery." By taking a moderate position, Lincoln persuaded all the border states to remain in the Union.

Foreign Relations. While meeting his other challenges, Lincoln managed to keep a check on foreign policy. In 1861, Secretary of State Seward suggested that the United States could be unified by provoking several European nations to war. The President quietly ignored this proposal.

In November, 1861, Captain Charles Wilkes of the U.S. Navy stopped the British ship *Trent* and removed two Confederate commissioners, James M. Mason and John Slidell. The British angrily demanded the release of the two men, and prepared for war to support their demand. The United States formally apologized, and freed Mason and Slidell. By doing so, Lincoln avoided a war that would have been disastrous to the United States. See TRENT AFFAIR.

Life in the White House. To Lincoln, the presidency meant fulfillment of the highest ambition that an American citizen could have. The Civil War destroyed any hope he may have had for happiness in the White House. Aside from directing military affairs and stiffening the will of the North, he carried an enormous burden of administrative routine. His office staff was small. He wrote most of his own letters and all his speeches. He made the final decisions on thousands of political and military appointments. For hours each day, he saw everyone who chose to call. During all his years in office, Lincoln was away from the capital less than a month.

Lincoln found some relaxation in taking carriage drives, and he enjoyed the theater. He regarded White House receptions and dinners more as duties than as pleasures. Lincoln's frequent visits to army hospitals tore his gentle heart. Late at night, he sometimes found solace by reading Shakespeare or the Bible. But his official duties left little time for diversions.

To Mrs. Lincoln, life in the White House was a tragic disappointment. Her youngest brother, three half brothers, and the husbands of two half sisters were serving in the Confederate army, and she faced constant suspicion of disloyalty. The pressures of everyday life weighed heavily on her high-strung nature. Jealousy and outbursts of temper cost her many friendships.

Two of Lincoln's sons, William Wallace and Thomas, lived in the White House. For nearly a year, "Willie" and "Tad" enlivened the mansion with their laughter and pranks. Willie's death on Feb. 20, 1862, grieved the President deeply. Mrs. Lincoln could not be consoled. Robert Lincoln had been a student at Harvard when his father was elected. He remained in school until February, 1865, when he was appointed to General Grant's staff as a captain.

The Emancipation Proclamation. By late summer of 1862, Lincoln was convinced that the time had come for a change in policy toward slavery. Several foreign governments sympathized with the South. But they did not dare support slavery, which mankind condemned as evil. Freed slaves could serve as Union soldiers. Besides, many Northerners who had been indifferent to slavery now believed that it had to be stamped out. Lincoln decided to issue a proclamation freeing the slaves. He did not ask the advice of his Cabinet, but he did tell the members what he intended to do. On Seward's advice, he withheld the proclamation until a Northern victory created favorable circumstances.

The Battle of Antietam, fought on Sept. 17, 1862, served Lincoln's purpose. He issued a preliminary proclamation five days later. Lincoln declared that all slaves in states, or parts of states, that were in rebellion on Jan. 1, 1863, would be free. He issued the final proclamation on January 1. Lincoln named the states and parts of states in rebellion, and declared that the slaves held there "are, and hence-forward shall be, free." See EMANCIPATION PROCLAMATION.

Actually, the proclamation freed relatively few slaves. It applied only to Confederate territory, where federal officers could not enforce it. The proclamation did not affect slavery in the loyal border states. Lincoln repeatedly urged those states to free their slaves, and to pay the owners for their loss. He promised financial help from the federal government for this purpose. The failure of the states to follow his advice was one of his great disappointments.

The Emancipation Proclamation did have a great long-range effect. In the eyes of other nations, it gave a new character to the war. In the North, it paved the way for Amendment 13 to the Constitution. This amendment, adopted in December, 1865, ended slavery in all parts of the United States.

The Gettysburg Address. Union armies won two great victories in 1863. General George G. Meade's Union forces defeated the Confederates under Lee at Gettysburg, Pa., during the first three days of July. On July 4, Vicksburg, Miss., fell to Grant's troops. This city had been the last Confederate stronghold on the Mississippi River. "The Father of Waters again goes unvexed to the sea," Lincoln declared.

On Nov. 19, 1863, ceremonies were held to dedicate a cemetery on the Gettysburg battlefield. The principal speaker was Edward Everett, one of the greatest orators of his day (see EVERETT, EDWARD). Everett spoke for two hours. Lincoln was asked to say a few words, and spoke for three minutes.

Many writers have said that Lincoln scribbled his speech while traveling on the train to Gettysburg. This is not true. He prepared the address carefully, well in advance of the ceremonies. Some writers have also said that the masterly quality of his speech went unrecognized for years. This, too, is false. Everett and many others knew at once that Lincoln's ringing declaration that "government of the people, by the people, for the people, shall not perish from the earth" would live as long as democracy itself. For the complete text of the speech, see GETTYSBURG ADDRESS.

The victories at Gettysburg and Vicksburg seemed to promise an early peace. But the war went on. In March, 1864, Lincoln put Grant in command of all the Union armies. The Army of the Potomac started to march toward Richmond two months later. At the same time, General William T. Sherman began his famous march from Tennessee to Atlanta, and then to the sea.

Election of 1864. Grant met skillful resistance in the South, and suffered thousands of casualties. Many people called him "the butcher," and condemned Lincoln for supporting the cigar-smoking commander. In June, the Republican national convention reluctantly renominated Lincoln for the presidency. Former Senator Andrew Johnson of Tennessee was nominated for Vice-President. The Democrats chose General George B. McClellan as their candidate for President, and Representative George H. Pendleton of Ohio for Vice-President. A group of radical Republicans persuaded General John C. Frémont to run for President.

Lincoln became less and less popular as the summer wore on. Late in August, he confessed privately that "it seems exceedingly probable that this administration will not be re-elected." Then the military trend changed. Admiral David G. Farragut had won the Battle of Mobile Bay on August 5, and Sherman's hard-marching troops entered Atlanta on September 2. A series of Union victories cleared Confederate forces from the Shenandoah Valley of Virginia. Many discouraged Northerners took heart again.

Frémont withdrew from the campaign, and the voters swung to Lincoln. The President defeated McClellan by an electoral vote of 212 to 21, and a popular majority of more than 400,000 votes.

Second Inauguration. The end of the war was clearly in sight when Lincoln took the oath of office a second time, on March 4, 1865. Grant had besieged Lee's weary troops at Petersburg, Va. The Southern armies were wasting away in Grant's bulldog grip. Sherman left a wide track of destruction as he marched through Georgia and the Carolinas.

For the first time, Lincoln could think of reuniting the nation. He never spoke words more truly characteristic, nor more beautiful, than in his second inaugural address. Instead of demanding vengeance on the South, he asked for "malice toward none" and "charity for all." He implored the people "to bind up the nation's wounds; to care for him who shall have borne the battle, and for his widow, and his orphan—to do all which may achieve and cherish a just and lasting peace . . ."

Photographs taken of Lincoln shortly after his second inauguration show the effect of four years of war. His face had become gaunt and deeply lined. He slept little during crises in the fighting, and his eyes were ringed with black. Lincoln ate his meals irregularly, and had almost no relaxation.

In spite of his exhaustion, Lincoln continued to see widows and soldiers who called at the White House. His delight in rough humor never deserted him. More than once, he shocked members of his Cabinet by reading to them from such popular humorists as Artemus Ward and Orpheus C. Kerr. Even so, the strain of melancholy that had appeared in him as a young man deepened.

As a youth, Lincoln's biting wit had once brought him a challenge to a duel from a man he had offended. After that, he made it a point not to hurt other people's feelings. Near the close of the war, he said: "So long as I have been here I have not willingly planted a thorn in any man's bosom."

Lincoln came to have a quiet confidence in his own judgment as he met the trials of war. Yet he had no false pride. He was a man of genuine humility. The war brought out his best qualities. He could rise to each new challenge. He was a master politician, and timed his actions to the people's moods. He never tried to dictate to them. He led men by persuasion. Horace Greeley said: "He slowly won his way to eminence and fame by doing the work that lay next to him—doing it with all his growing might—doing it as well as he could, and learning by his failure, when failure was encountered, how to do it better."

End of the War. On April 9, 1865, Lee surrendered to Grant at Appomattox Court House in Virginia. Under authority from Lincoln, Grant extended generous terms to Lee and his army. A great wave of joy swept the North when the fighting ended.

Lincoln spoke soberly of the future to a crowd that serenaded him on the night of April 11. Louisiana had applied for readmission to the Union under Lincoln's plan of reconstruction. Many Northerners wanted to impose harsher terms. Some complained that Negroes would not receive the right to vote under Louisiana's new government. "I would myself prefer," said Lincoln, "that it [the vote] were now conferred on the very intelligent, and on those who serve our cause as soldiers."

Many persons insisted that Lincoln decide if "the

LINCOLN'S SECOND ELECTION

Place of Nominating Convention	Baltimore
Ballot on Which Nominated	1st
Democratic Opponent	George B. McClellan
Electoral Vote	212 (Lincoln) to 21 (McClellan)
Popular Vote	2,206,938 (Lincoln) to 1,803,787 (McClellan)
Age at Inauguration	56

Lincoln's Family included, *left to right,* Mrs. Mary Todd Lincoln and their sons, William Wallace (Willie), Robert Todd, and Thomas (Tad). Robert was away at college during most of Lincoln's presidency.

Library of Congress

seceded states, so called, are in the Union or out of it." No matter, said the President in his last public address on April 11, 1865, "finding themselves safely at home, it would be utterly immaterial whether they had ever been abroad." Lincoln admitted that the new government of Louisiana was imperfect. But, he asked, "Will it be wiser to take it as it is and help improve it, or to reject and disperse it?"

Assassination. On the evening of April 14, 1865, Lincoln attended a performance of *Our American Cousin* at Ford's Theatre in Washington. A few minutes after 10 o'clock, a shot rang through the crowded house. John Wilkes Booth, one of the best-known actors of the day, had shot the President in the head from the rear of the presidential box. In leaping to the stage, Booth caught his spur in a flag draped in front of the box. He fell and broke his leg. But he limped across the stage brandishing a dagger and crying: "Sic semper tyrannis" (Thus ever to tyrants), the motto of Virginia.

Lincoln was carried unconscious to a neighboring house. His family and high government officials surrounded him. He died at 7:22 A.M. on April 15.

As President, Lincoln had been bitterly criticized. After his death, even his enemies praised his kindly spirit and selflessness. Millions of people had called him "Father Abraham." They grieved as they would have grieved at the loss of a father. The train carrying Lincoln's body started west from Washington. Mourners lined the tracks as it moved across the country. Thousands wept as they looked upon his face for the last time. On May 4, Lincoln was buried in Oak Ridge Cemetery at Springfield, Ill. The monument on his grave is a place of universal pilgrimage.

PAUL M. ANGLE

Related Articles in WORLD BOOK include:

Abolitionist
Booth (John Wilkes)
Breckinridge, John C.
Civil War
Davis, Jefferson
Debate (picture)
Douglas, Stephen A.
Emancipation Proclamation
Everett, Edward
Fort Sumter
Gettysburg Address
Grant, Ulysses S.
Hamlin, Hannibal
Herndon, William H.
Illinois (State Parks, Memorials; color picture, Land of Lincoln)
Johnson, Andrew
Kentucky (color picture, Lincoln's Birthplace)
Letter Writing (picture)
Lincoln, Mary Todd
Lincoln, Robert Todd
Lincoln Memorial
Lincoln's Birthday
McClellan, George B.
Mount Rushmore National Memorial
Nicolay, John G.
Political Party
President of the United States
Republican Party
Rutledge, Ann
Saint-Gaudens, Augustus (picture)
Slavery
Washington, D.C. (color pictures, A Famous Statue of Lincoln, Ford's Theatre)

Outline

I. Early Life
  A. Family Background
  B. Boyhood
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II. New Salem Years
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  H. The Emancipation Proclamation
  I. The Gettysburg Address
  J. Election of 1864
  K. Second Inauguration
  L. End of the War
  M. Assassination

Questions

How did Lincoln become involved in the debates with Douglas? How did the debates affect Lincoln's career?

Herbert Georg Studio

Lincoln's Home in Springfield, Ill., is a famous state memorial. Lincoln bought this plain white frame house in 1844. He and his family lived there until he became President in 1861.

Why did Chief Justice Taney attack Lincoln so bitterly? How did Lincoln answer Taney's attack?

When and how did Lincoln first express himself on the subject of slavery?

How did Lincoln find relaxation in the White House?

What was Lincoln's first political office?

Who persuaded Lincoln to become a lawyer? How did Lincoln study for the bar?

What did Lincoln consider to be the main issue of the Civil War?

How did Lincoln get his early education?

What did Lincoln's second inaugural address show about his intentions toward the South?

What was "circuit riding"? Why did Lincoln enjoy it?

Why did repeal of the Missouri Compromise cause Lincoln to go back into politics?

How long did Lincoln serve in the army?

Why did Lincoln at first deny that the Civil War centered on slavery? Why did he later change his stand?

Why did Lincoln fail to win re-election to the U.S. House of Representatives?

Books to Read

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LINCOLN, MARY TODD (1818-1882), the wife of President Abraham Lincoln, was the daughter of Robert S. Todd, a banker of Lexington, Ky. She was born on Dec. 13, 1818, and went to school in Lexington. In 1839, at the age of 21, she moved to Springfield, Ill., to live with a married sister. There she met Lincoln, a young lawyer. They were married on Nov. 4, 1842.

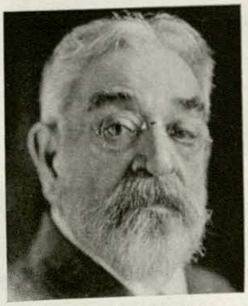
Mrs. Lincoln achieved her greatest ambition when her husband was elected President. But her four years as First Lady brought sorrow rather than happiness. Many persons unjustly suspected her of disloyalty to the Union because she came from the South. In addition, Mrs. Lincoln's haughty manner made her unpopular among the wives of government officials. The death of the Lincolns' third son, William Wallace, in 1862 caused her deep grief. In 1865, the shock of the assassination of Lincoln left her a mental and physical wreck.

Years of travel failed to restore Mrs. Lincoln's health, which was further weakened in 1871 by the death of another son, Thomas. Her mental depression deepened until her oldest son, Robert, committed her to a private sanitarium in 1875. She was released the next year. Mrs. Lincoln died on July 16, 1882, in the Springfield home of her sister. She was buried beside her husband in the Lincoln Tomb in Springfield. Paul M. Angle

See also Lincoln, Abraham (Lincoln's Family; Life in the White House; picture).

LINCOLN, NANCY HANKS. See Lincoln, Abraham (Early Life); Indiana (Interesting Places to Visit).

LINCOLN, ROBERT TODD (1843-1926), the oldest son of President Abraham Lincoln, became a well-known statesman and lawyer. In 1881, President James A. Garfield named him Secretary of War. Lincoln held the same post under President Chester A. Arthur. From 1889 to 1893, he served as minister to Great Britain. He then became associated with the Pullman Company, and served as president of the firm from 1897 to 1911.



Robert T. Lincoln

Lincoln was born in Springfield, Ill., and attended the Harvard Law School. He served in the Union Army under General Ulysses S. Grant. After the Civil War, he practiced law in Chicago. Richard N. Current

LINCOLN CATHEDRAL. See Cathedral (Famous Cathedrals; picture).

LINCOLN HIGHWAY stretches 3,385 miles from New York City to San Francisco. It is sometimes called the *Main Street of the United States.* In 1912, Carl G. Fisher had the idea of a transcontinental highway to encourage better roads. The automotive industry raised money for the highway. President William Howard Taft felt the highway would help national unity. In 1913, Fisher decided "Lincoln" would be a patriotic name for it. Construction began in 1914. The road is known as U.S. 30 for most of its length. Archibald Black

See also Fisher, Carl G.; Columbia River Highway.

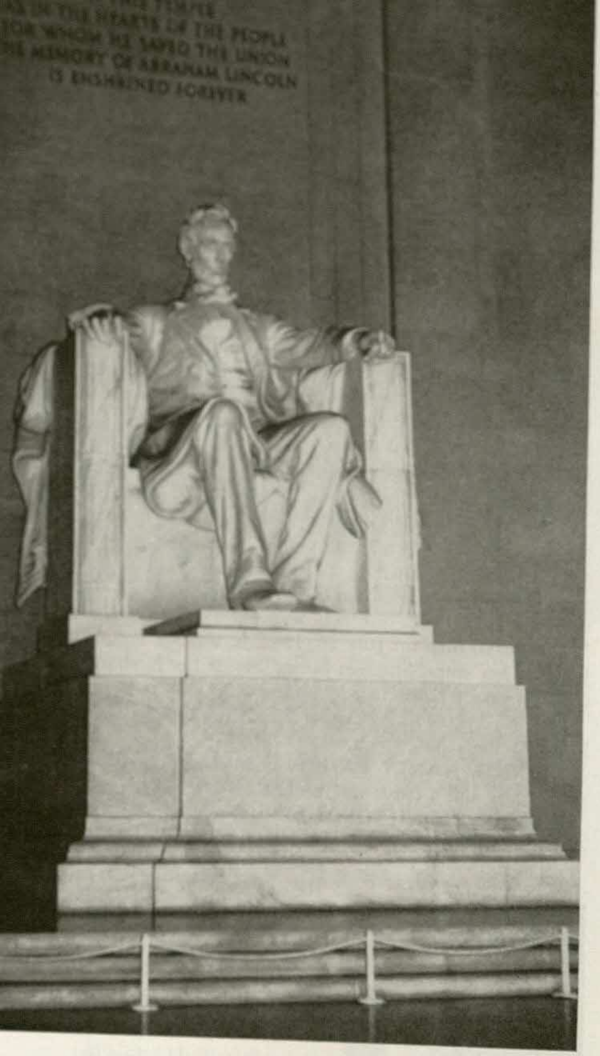
LINCOLN MEMORIAL is a beautiful national monument in Washington, D.C., that honors Abraham Lincoln. It stands at the end of the Mall and ranks as one of the most handsome memorials of the 1900's.

The massive marble building is 188 feet long and 118 feet wide. It has a great hall surrounded by 36 Doric columns. The columns stand for the 36 states in the Union when Lincoln was President. The decorations show the seals of the 48 states that existed when the building was dedicated. The hall has three sections. In the center section, which is open in front, sits a gigantic statue of Lincoln by Daniel Chester French. The side sections have tablets with the Gettysburg Address and the Second Inaugural Address, and two wall paintings by Jules Guerin. The paintings are entitled *Emancipation* and *Reunion*.

The building stands on a high terrace that is reached by an imposing flight of steps. In front lies a long pool. The Potomac River can be seen from one side of the building. The other side presents a magnificent view up the Mall to the Washington Monument.

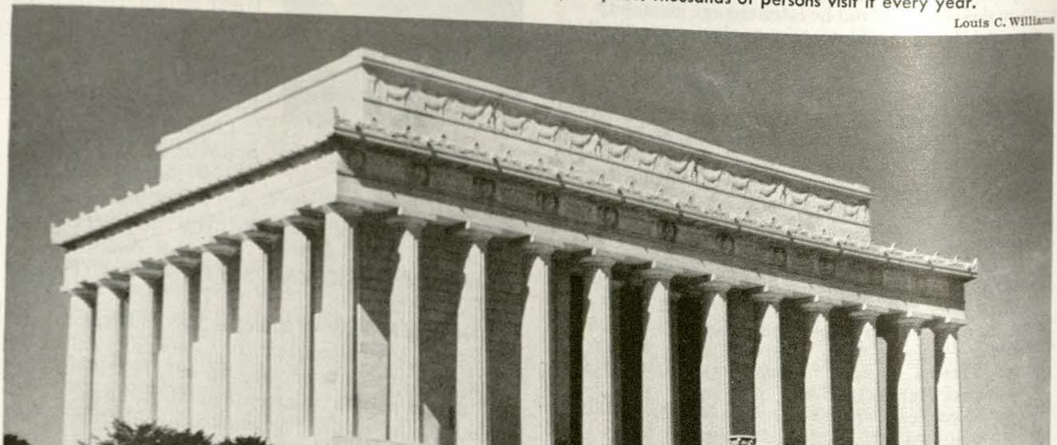
A national Lincoln memorial had been urged since 1867, but not until 1911 did Congress pass the law creating a Lincoln Memorial Commission. This commission chose the design by Henry Bacon and the site for the building. The cornerstone was laid on Feb. 12, 1915. The building was dedicated on May 30, 1922. Chief Justice William Howard Taft, as chairman of the Lincoln Memorial Commission, presented the memorial to President Warren G. Harding who accepted it for the United States. Some criticized the design of the building. But it has been accepted as an expression of American ideals, and has inspired millions of visitors to Washington, D.C.

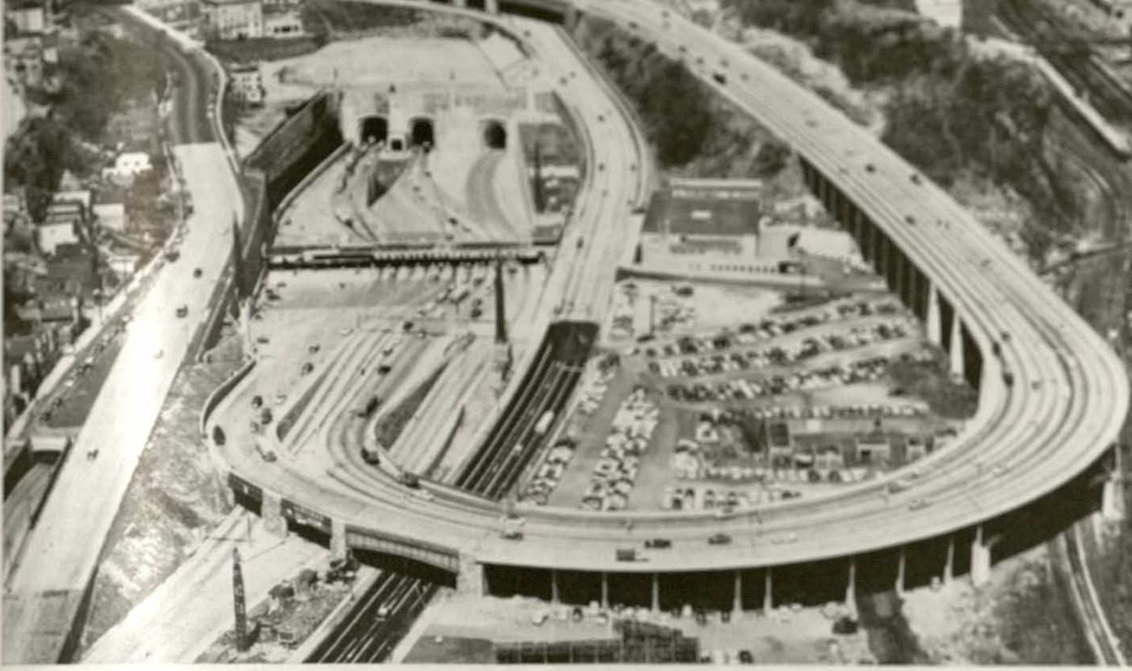
Critically reviewed by LINCOLN MEMORIAL


AS IN THE HEARTS OF THE PEOPLE
FOR WHOM HE SAVED THE UNION
THE MEMORY OF ABRAHAM LINCOLN
IS ENSHRINED FOREVER

A Majestic Statue of Lincoln, *left,* done by sculptor Daniel Chester French, dominates the interior of the Lincoln Memorial in Washington, D.C., *below.* The gleaming white memorial keeps alive the memory of one of the nation's greatest Presidents. The massive marble structure stands on a terraced mound in a great open space. Thousands of persons visit it every year.

Louis C. Williams





Port of N.Y. Authority

Lincoln Tunnel connects with the New Jersey Turnpike by means of this $17,000,000 looping road on the New Jersey side of the Hudson River. At the lowest point the tunnel dips 97 feet below the surface of the river.

LINCOLN MEMORIAL UNIVERSITY is a coeducational liberal arts school at Harrogate, Tenn. It has co-operative programs with other colleges in engineering, forestry, and medical technology. It has one of the world's largest Lincoln libraries. The school was founded in 1897. For enrollment, see UNIVERSITIES (table).

LINCOLN PARK, Mich. (pop. 54,933; alt. 585 ft.), is a residential city in the southwestern part of the Detroit metropolitan area (see MICHIGAN [map]). Most of its workers are employed in nearby auto and steel factories. The area is noted as the place where Chief Pontiac assembled his braves for the attack on Detroit in 1763. Incorporated in 1925, Lincoln Park has a mayor-council government. WILLIS F. DUNBAR

LINCOLN TUNNEL is a tunnel for motor traffic under the Hudson River. It joins midtown New York City with Weehawken, N.J. The tunnel has three tubes, each with two traffic lanes. The 7,482-foot center tube, opened in 1937, carries vehicles in either or both directions, depending on traffic needs. Westbound vehicles travel in the 8,216-foot north tube, opened in 1945. The south tube is for eastbound traffic. The completion of this tube in 1957 brought the total cost of the Lincoln Tunnel to about $190,000,000. About 30,000,000 vehicles use the tunnel every year. See also HUDSON RIVER TUNNELS (picture).

LINCOLN UNIVERSITY is a state-supported coeducational school at Jefferson City, Mo. It has an arts and sciences college; schools of journalism and law; and a graduate school. The university was founded in 1866. For enrollment, see UNIVERSITIES (table).

LINCOLN UNIVERSITY is a privately controlled coeducational liberal arts school at Lincoln University, Pa., affiliated with the Presbyterian Church. Although it was the first school chartered (1854) to grant academic degrees to Negro youth, all races have always been admitted. For enrollment, see UNIVERSITIES (table).

LINCOLN'S BIRTHDAY is a legal holiday in 31 states of the United States. Abraham Lincoln, the 16th President, was born on Feb. 12, 1809. Many civic and political groups celebrate his birthday anniversary.

The first observance of his birthday anniversary occurred in 1866, the year following his assassination. At that time, the President, his Cabinet, members of Congress, and representatives of the armed forces and the diplomatic corps met in his honor.

The Republican Club of New York City has held a dinner on that day each year since 1887. The Republican National Committee holds an annual fund-raising dinner on Lincoln's birthday anniversary. The Lincoln farm, near Hodgenville, Ky., was purchased for the 100th anniversary and was dedicated on Feb. 12, 1909. The dedication of the Lincoln Memorial in Washington, D.C., took place on Feb. 12, 1922. Congress established a Lincoln Sesquicentennial Commission that prepared programs and coordinated local activities in celebrating Lincoln's 150th birthday anniversary in 1959. RAYMOND HOYT JAHN

See also LINCOLN, ABRAHAM.

LIND, JENNY (1820-1887), a Swedish soprano, became one of the most famous singers of the 1800's. She had a brilliant career in opera and on the concert stage. Her rich and warm coloratura voice and her remarkable vocal control were unique, and won for her the title the "Swedish Nightingale" from an adoring public.

Miss Lind was born in Stockholm. She made her debut in 1838 as Agathe in *Der Freischütz*. Three years later she went to Paris to study, and then traveled to Dresden, Germany, to perfect her knowledge of the German language.

After 1849, Miss Lind gave up her career as an opera singer. From 1850 to 1852 she toured the United States under the management of P. T. Barnum (see BARNUM, PHINEAS TAYLOR). SCOTT GOLDTHWAITE

U&U

Charles A. Lindbergh won the nickname "Lone Eagle" because he made the first solo nonstop flight from New York to Paris. Huge crowds greeted Lindbergh's plane when he landed in Paris, and many countries presented him with awards for his achievement.

LINDBERGH, CHARLES AUGUSTUS (1902-), an American aviator, made the first solo flight across the Atlantic Ocean. He made it in the single-engine airplane, *Spirit of St. Louis*, for which citizens of St. Louis, Mo., had given funds. He took off from Roosevelt Field, New York City, at 7:52 A.M. on May 20, 1927, and landed at Le Bourget Field near Paris the next day at 10:21 P.M. Paris time (5:21 P.M. New York time). He had flown more than 3,600 miles in 33½ hours.

Lindbergh was born on Feb. 4, 1902, in Detroit, Mich., and was brought up in Little Falls, Minn. His father, Charles Augustus Lindbergh, Sr. (1859-1924), was a member of the U.S. Congress from Minnesota from 1907 to 1917. Lindbergh studied at the University of Wisconsin for two years, and then took a course in flying at Lincoln, Nebr. He made his first solo flight in 1923 in a plane he had bought for $500. In 1924, he enrolled as a flying cadet in the United States Air Service Reserve at Brooks Field, San Antonio, Tex. The following year he was commissioned a first lieutenant in the Missouri National Guard. He then entered the United States Air Mail Service as a pilot between Chicago and St. Louis.

Lindbergh was determined to win the $25,000 prize which was offered to the aviator making the first New York-to-Paris nonstop flight. The prize had been offered in 1919 by Raymond Orteig (1870-1939), a New York City hotel owner, but no one had yet won it. Ten days before the transatlantic flight, Lindbergh set a coast-to-coast record by flying from San Diego, Calif., to Long Island, N.Y., in 21 hours and 20 minutes. He stopped overnight at St. Louis on this record-breaking flight.

An International Hero. Lindbergh crossed the ocean successfully. More than 100,000 people had gathered at the airfield in Paris for the end of the flight. They greeted Lindbergh with wild enthusiasm. "The Lone Eagle" was honored by many European rulers and received numerous medals, including the French Legion of Honor, the English Royal Air Cross, and the Order of Leopold from Belgium. On his return to the United States he was officially welcomed by President Calvin Coolidge, who presented him with the Distinguished Flying Cross. He also was made a colonel in the Air Reserve.

The New York Times paid $250,000 for his story of the flight, and his book *We* became a best seller. The Daniel Guggenheim Foundation for the Promotion of Aeronautics sponsored an air tour which took Lindbergh and *The Spirit of St. Louis* to 75 cities of the United States. As America's "ambassador of good will," he flew nonstop from Washington, D.C., to Mexico City.

In 1929, Lindbergh was married to Anne Spencer Morrow. The couple set a new transcontinental flight record in 1930. The next year, they flew to the Orient as "ambassadors of good will." Lindbergh became technical adviser to several airlines, and pioneered many of the air routes to South America and across the Pacific for Pan American World Airways.

The couple's first child, Charles Augustus, Jr., was kidnaped and killed in 1932. Public reaction to this crime led to passage of the so-called "Lindbergh Laws," which make interstate kidnaping a crime against Federal law (see KIDNAPING).

From 1935 to 1939, the Lindberghs lived in Europe. In France, Lindbergh worked with Alexis Carrel in the development of a "mechanical heart." The Lindberghs also visited Germany, touring German aviation centers.

World War II. For four months in 1939, Lindbergh served with the United States Air Corps and the National Advisory Committee for Aeronautics. Then he became a spokesman for those believing in neutrality for the United States during World War II. He testified before Congress in 1941 against the Lend-Lease Act, saying that he would prefer to see neither side win the war, but rather have a negotiated peace. Later that year, he resigned his commission in the United States Army Air Corps Reserve, after President Franklin D. Roosevelt criticized him for his attitude.

After the United States entered World War II, Lindbergh worked as a technical adviser to manufacturers of military aircraft. In 1944, the War Department sent him to the Pacific to study the operation in combat of the P-38 twin-engine fighter planes. He flew about 50 missions. He won credit for extending the range of the P-38 by 500 miles.

After the war, Lindbergh was named special consultant to the Chief of Staff of the United States Air Force. In 1954 he became a brigadier general in the Air Force Reserve, and President Dwight D. Eisenhower named him to a committee selecting a site for the United States Air Force Academy. The site finally chosen was near Colorado Springs, Colo. (see UNITED STATES AIR FORCE ACADEMY). Lindbergh became a member of the academy's first Board of Visitors in 1956. He also continued to serve as a special consultant to the

Charles A. Lindbergh and his wife, Anne, often flew together when he pioneered new air routes to Latin America, Asia, and Europe. Lindbergh started as an air-mail pilot.

Wide World

Air Force and as technical adviser to Pan American World Airways throughout 1956 and 1957.

His Awards. In 1949, Lindbergh won the Wright Brothers Memorial Trophy "for significant public service of enduring value to aviation in the United States." In 1953, he received the Daniel Guggenheim medal for his "pioneering achievements in flight and air navigation." His autobiography, *The Spirit of St. Louis*, won the 1954 Pulitzer prize for biography. Lindbergh also won the Congressional Medal of Honor, the Distinguished Service Cross, the Woodrow Wilson medal, the Hubbard medal, and other awards. WELMAN A. SHRADER

Anne Morrow Lindbergh (1906-), the wife of Charles A. Lindbergh, is an American poet and essayist. Critics have called her work sentimental, but sincere and honest. One of her most popular books, *Gift from the Sea* (1955), is a long essay that questions the meaning of existence for the individual woman. Her other writings include *North to the Orient* (1935), *Listen! the Wind* (1938), *The Wave of the Future* (1940), *The Steep Ascent* (1944), and *The Unicorn and Other Poems* (1956).

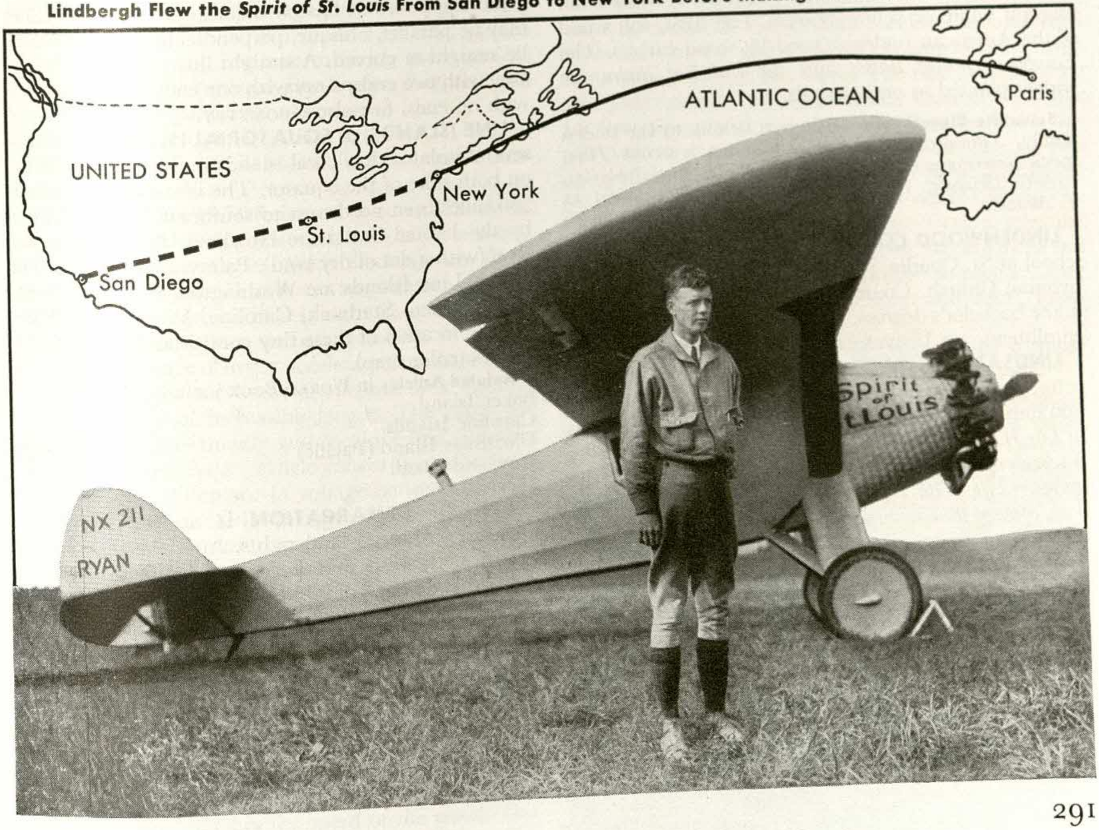
Mrs. Lindbergh, a licensed pilot and radio operator, made many long air trips with her husband. These adventures furnished material for her books.

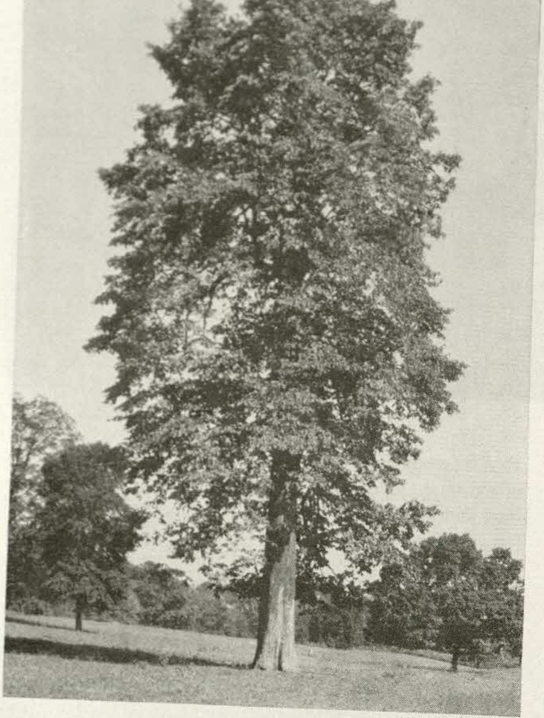
She was born in Englewood, N.J., the daughter of Dwight W. Morrow, who was United States Ambassador to Mexico from 1927 to 1930 (see MORROW, DWIGHT WHITNEY). She was graduated from Smith College in 1927. Mrs. Lindbergh began writing poetry as a schoolgirl. CARL NIEMEYER

See also AIRPLANE (The Airplane Comes of Age).

LINDBERGH LAW. See KIDNAPING.

Lindbergh Flew the *Spirit of St. Louis* From San Diego to New York Before Making His Transatlantic Flight.





U.S. Forest Service

The American Linden, or Basswood, an attractive shade tree with dense foliage, is known for its symmetrical outline.

LINDEN is any one of a group of graceful shade trees that grow in many parts of the world. The trees are also called *lime tree*, *linn*, and *basswood* (see BASSWOOD). The *American linden* grows 120 feet high. It bears small fragrant white or yellow flowers. The light, soft wood of the American linden is used by wood carvers. The *European cut-leaf linden* and the *little-leaf linden* are widely planted as ornamentals.

Scientific Classification. Lindens belong to the linden family, *Tiliaceae*. The American linden is genus *Tilia*, species *americana;* the European cut-leaf is *T. platyphyllos*, variety *laciniata;* the little-leaf linden is classified as *T. cordata*.

THEODORE W. BRETZ

LINDENWOOD COLLEGE FOR WOMEN is a private school at St. Charles, Mo. It is affiliated with the Presbyterian Church. Courses in liberal and fine arts lead to the bachelor's degrees. It was established in 1827. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LINDSAY, HOWARD (1899-), an American actor, playwright, and producer, specializes in comedies and musical comedies. His most famous acting role was in *Life With Father*, which also starred his wife, Dorothy Stickney. Some of the plays he wrote or helped write include *Life With Father*, *She Loves Me Not*, *Anything Goes*, *State of the Union*, and *The Great Sebastians*. He also directed many musicals and comedies. Lindsay was born in Waterford, N.Y., and attended Harvard University.

MARY VIRGINIA HEINLEIN

See also CROUSE, RUSSEL.

LINDSAY, VACHEL (1879-1931), became one of the first American poets to reflect the spirit of the Middle West in poetry. His verse is noted for its jazzlike rhythms. His works include *General William Booth Enters into Heaven and Other Poems* (1913), his first published collection; *The Congo and Other Poems* (1914); and *The Chinese Nightingale and Other Poems* (1917). Lindsay was often called "the vagabond poet" because he took long walking tours, on which he recited verse in exchange for food.

Macmillan Co.

Vachel Lindsay

He was born Nicholas Vachel Lindsay in Springfield, Ill. He studied for three years at Hiram College in Ohio and then entered the Chicago Art Institute. After he published his first poems, he became a popular and successful lecturer and reader of poetry.

WILLIAM VAN O'CONNOR

LINDSEY, BENJAMIN BARR (1869-1943), was an American judge and author. He originated many features of the juvenile-court system and became an authority on delinquent youth. For 26 years he served as judge of the Denver, Colo., juvenile court, where he demonstrated the value of a carefully administered probation system (see JUVENILE COURT).

Lindsey's writings on social and political problems, especially on companionate (trial) marriage, aroused much opposition and led to his disbarment as a lawyer in 1929. But he was reinstated, moved to California, and became a judge of the Superior Court of California in 1934. Lindsey was born in Jackson, Tenn., and studied law in Denver.

H. G. REUSCHLEIN

LINE. See FISHING (Line).

LINE, in geometry, may be described as the track of a moving point. It has no breadth or thickness. Lines may be parallel, oblique, perpendicular, and they may be straight or curved. A straight line may be a *line segment* with two ends, a *ray* with one end, or an *endless line* with no ends. See also GEOMETRY.

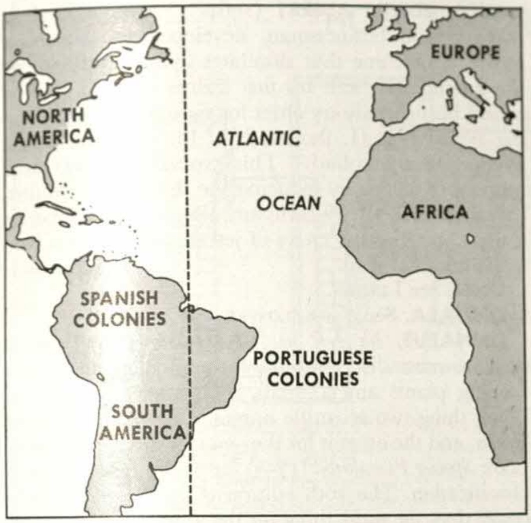
LINE ISLANDS, or **EQUATORIAL ISLANDS** consist of several isolated, low coral islands in the central Pacific, on both sides of the equator. The islands extend about 400 miles from northwest to southeast. Those claimed by the United States are Howland, Baker, Kingman Reef (with a dot of dry land), Palmyra, and Jarvis. The British Line Islands are Washington, Fanning, Christmas, Malden, Starbuck, Caroline, Vostok, and Flint. For the location of these tiny coral islands, see PACIFIC OCEAN (color map).

EDWIN H. BRYAN, JR.

Related Articles in WORLD BOOK include:

Baker Island
Caroline Islands
Christmas Island (Pacific)
Howland Island
Jarvis
Malden
Palmyra
Starbuck Island
Vostok Island

LINE OF DEMARCATION is an imaginary line once used to settle land rights. After the discovery of America, Spanish and Portuguese explorers touched many of the same lands in the Americas. Disputes arose as to which country was entitled to them. In 1493, Pope Alexander VI tried to end these disputes. He drew an imaginary line from north to south, 100 leagues (about 250 miles) west of the Azores and Cape Verde Islands. This became known as the Line of Demarcation. Spain was to have all the land its navigators had discovered or might discover west of the line, provided they had not previously been owned by any Christian ruler. Portugal



Line of Demarcation Set by the Treaty of Tordesillas.

got the land east of the line by similar terms. Spain's possessions became known as the West Indies, and Portugal's as the East Indies.

In the 1494 Treaty of Tordesillas, Spain and Portugal established the line 370 leagues west of the Cape Verde Islands.

This new line was the basis on which Portugal claimed, and eventually obtained, Brazil. It was never surveyed, and its exact determination was disputed. A treaty signed at Saragossa in 1529 fixed the line at 297½ leagues east of the Moluccas Islands. This was changed by later treaties. The line was to divide the Americas between Spain and Portugal. But France, England, and The Netherlands paid little attention to it.

See also ALEXANDER (VI).

LINE OF FORCE. See ELECTRIC GENERATOR (A Simple Generator).

LINEAR ACCELERATOR is one of several kinds of machines for accelerating particles, such as protons and electrons, to high energies. Such machines are often called atom smashers. In a linear accelerator, particles move down the machine in a straight line, rather than in a circular path, as they do in a cyclotron.

In a *drift tube* type of linear accelerator, particles move down the center of a cylindrical vacuum tank through a series of tubes of increasing length. The tubes are rapidly charged alternately with positive and negative electrical charges. As a particle moves from one tube to the next, the difference in voltage between the two tubes accelerates it. While the particles are inside the tubes, they coast, or drift, at a constant velocity. As a particle enters a tube after being accelerated, it travels at a higher rate of speed than it did in the previous tube. Each tube is longer than the tube before it, so the particles will spend the same amount of time passing through each tube. Drift tube accelerators have been built that can accelerate protons up to 50 Mev, or 50,000,000 electron volts (see ATOM [Terms]).

In a *traveling-wave* accelerator, electrons are accelerated by a traveling electric wave that runs from one end of the accelerator to the other. The speed of the electron in the accelerator matches the speed of the wave. The electron gains energy from the wave as it travels. This works somewhat as a surfboard rider riding on an ocean wave gathers speed as the wave approaches the beach. Accelerators of the traveling-wave type have been built to accelerate electrons up to energies of several hundred million electron volts.

The largest of these accelerators is located at Stanford University in California. ROBERT L. THORNTON

See also ATOM (Inside the Atom); ATOM SMASHER with its list of Related Articles; MESON; VAN DE GRAAFF GENERATOR.

LINEAR MEASURE. See WEIGHTS AND MEASURES.

LINEN, *LIHN uhn*, refers to yarn and cloth made from fibers obtained from the stalk of the flax plant. The fibers range in length from 6 to 40 inches. They consist mainly of cellulose.

Linen Fabrics. Flax ranks among the strongest natural fibers known. It is used in products that require high strength, including sewing thread, fish nets, fire hose, and mattress covers. But new synthetic fibers, such as nylon and Dacron, are even stronger. They have replaced linen for some uses. Linen can be bleached white and has wide use in fine tablecloths, napkins, and handkerchiefs. It is also highly water absorbent and useful for towels.

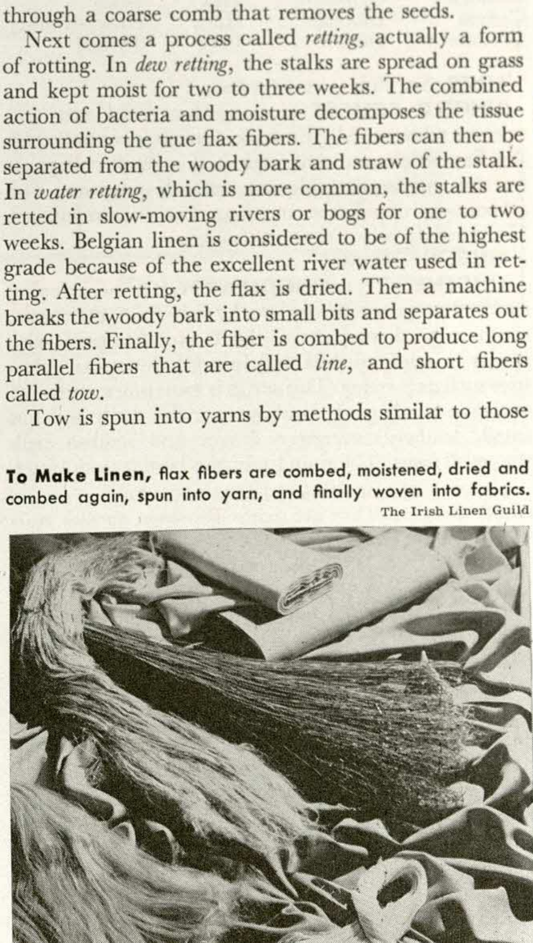
Preparing the Fibers. Flax harvested in late summer produces the best quality linen. The stalks are pulled, tied into bundles, and dried in the sun. Then they pass through a coarse comb that removes the seeds.

Next comes a process called *retting*, actually a form of rotting. In *dew retting*, the stalks are spread on grass and kept moist for two to three weeks. The combined action of bacteria and moisture decomposes the tissue surrounding the true flax fibers. The fibers can then be separated from the woody bark and straw of the stalk. In *water retting*, which is more common, the stalks are retted in slow-moving rivers or bogs for one to two weeks. Belgian linen is considered to be of the highest grade because of the excellent river water used in retting. After retting, the flax is dried. Then a machine breaks the woody bark into small bits and separates out the fibers. Finally, the fiber is combed to produce long parallel fibers that are called *line*, and short fibers called *tow*.

Tow is spun into yarns by methods similar to those

To Make Linen, flax fibers are combed, moistened, dried and combed again, spun into yarn, and finally woven into fabrics.

The Irish Linen Guild



used for spinning cotton (see COTTON; SPINNING [Modern Spinning Machines]). Special machinery spins the long linen fibers into fine yarns.

History. The Egyptians grew flax along the Nile River 4,000 years ago. They wrapped their mummies in linen before placing them in tombs. Egyptian and Hebrew priests wore linen cloth at religious ceremonies. The ancient Greeks wore linen clothing, and the Romans knew how to make linen paper as well as cloth.

Modern use of linen began in Europe in the 1600's. Skilled Flemish and French workers who left their countries to escape religious persecution helped develop linen spinning and weaving in England, The Netherlands, and Germany. Linen fabrics from France, Belgium, and Ireland have become famous throughout the world.

The first American settlers planted flax seed so that they could make linen. But the invention of the cotton gin by Eli Whitney in 1793 made cotton yarn more economical than linen yarn. For this reason, the United States has never produced large amounts of fiber flax. It produces about 500 tons of fiber flax a year. The only place fiber flax is raised in the United States is in the Willamette Valley of Oregon. Annual world fiber flax production totals about 1,000,000 tons, of which Russia produces 70 per cent. ERNEST R. KASWELL

Related Articles in WORLD BOOK include:

Cambric
Canvas
Cretonne
Crinoline
Damask
Duck
Flax
Huck
Lace
Lawn
Linsey-Woolsey
Thread

LINER. See SHIP AND SHIPPING.

LINFIELD COLLEGE is a coeducational arts and sciences school at McMinnville, Ore. It is controlled by the Baptist church. Although it is a small college, it has an outstanding physics research program. The school was established in 1849. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LING. See HEATH.

LINGENBERRY, or **LINGONBERRY,** is a low, creeping shrub that grows in dry, rocky soil from the Arctic south to northern parts of the United States. It also occurs in northern Asia and in north European countries such as Sweden. This shrub is sometimes called the *mountain cranberry*. It is about 7 inches high and has small, leathery, evergreen leaves and reddish bell-shaped flowers. The round crimson berries taste bitter.

Scientific Classification. Lingenberries belong to the family *Ericaceae*. They are genus *Vaccinium*, species *vitis-idaea*.

LINGUISTICS. See PHILOLOGY.

LINIMENT, *LIN uh munt*, is a liquid preparation which is used to treat certain aches and pains in the body. It is usually rubbed on the skin to produce reddening and heat. Liniments usually act by causing irritation or stimulation that increases the blood supply to the area. Liniments often contain stimulating agents such as ammonia, camphor, croton oil, mustard, soap, and turpentine. Most liniments are poisonous when swallowed. They should not be used on sores and cuts unless a doctor advises it. AUSTIN EDWARD SMITH

LINING, BRAKE. See BRAKE.

LINK. See CHAIN.

LINK, EDWIN ALBERT (1904-), an American inventor and businessman, developed the *mechanical trainer*, a machine that simulates flying conditions on the ground. He built his first trainer in 1929, and received his first military order for six units in 1934. During World War II, thousands of Link trainers taught aviators to fly "blind." This ground training saved millions of dollars by reducing the flying time required to train a pilot. Link's company also produces elaborate trainers used by the crews of jet aircraft. He was born at Huntington, Ind. ROBERT B. HOTZ

LINN. See LINDEN.

LINNAEA. See TWINFLOWER.

LINNAEUS, *lih NE us*, **CAROLUS** (1707-1778), a Swedish naturalist, established the modern method for naming plants and animals. This system gives every living thing two scientific names. One name is for the *species*, and the other is for the *genus*, or group. Linnaeus' book *Species Plantarum* (1753) forms the basis for plant classification. The 10th edition of his *Systema Naturae* (1758) does the same thing for the animal kingdom. See CLASSIFICATION.

Ewing Galloway

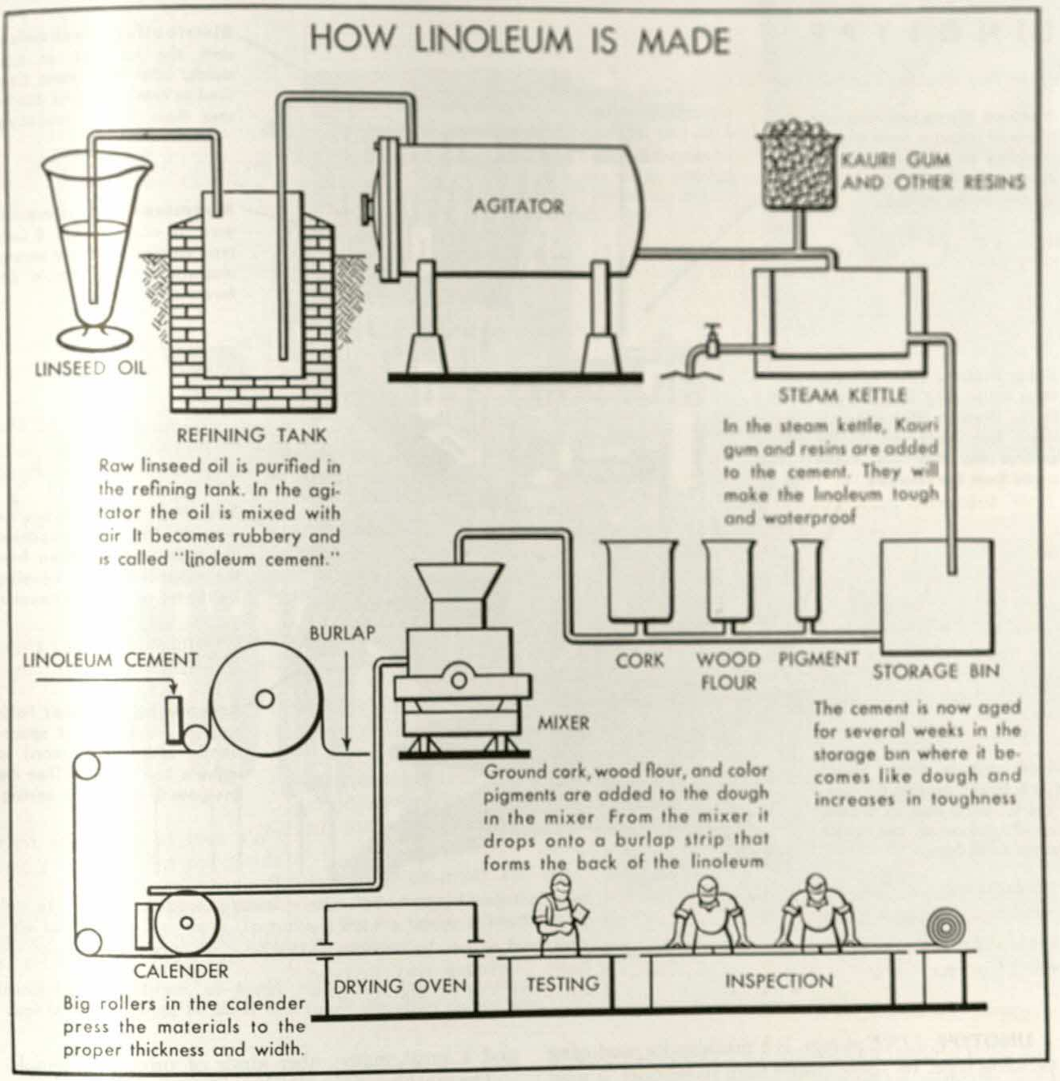
Carolus Linnaeus

Linnaeus was born KARL VON LINNÉ in South Råshult, Sweden. His father, the parish curate, wanted him to study for the ministry. But the boy was so interested in plants that friends urged his parents to send him to medical school. While in medical school, Linnaeus supervised a small botanical garden and began an insect collection. He wrote careful descriptions of all the kinds of plants he knew, and these notes formed the basis for his books. He became famous as CAROLUS LINNAEUS because he wrote his books in Latin.

With $50 given him by the Royal Society of Science, he spent five months in 1732 collecting plants in Lapland. During this 4,800-mile trip, he walked nearly a thousand miles. Linnaeus then went to The Netherlands, where he received his medical degree. When he returned to Stockholm to practice medicine, the Swedish government gave him a position. In 1742, Linnaeus became a professor of botany at the University of Uppsala. Ten years after his death, the Linnaean Society of London was founded to advance plant and animal classification. LORUS J. and MARGERY MILNE

LINNET, *LIN et*, is a small bird that lives in North America and northern Europe. It is a relative of the finch and gets its name because it eats *linseed*, or flaxseed (see FINCH). It also eats hemp. The male linnet is chestnut brown with crimson forehead, throat, and breast. The color changes at different ages. The same linnet may be called *gray linnet* or *red linnet* at various times. Linnets are favorite cage birds because of their sweet song and pleasant disposition. The North American linnet, called *redpoll* or *redpoll linnet*, builds its nest in the far north and migrates south in winter.

Scientific Classification. Linnets belong to the family *Fringillidae*. The redpoll is genus *Acanthis*, species *linaria*.



HOW LINOLEUM IS MADE

Raw linseed oil is purified in the refining tank. In the agitator the oil is mixed with air It becomes rubbery and is called "linoleum cement."

In the steam kettle, Kauri gum and resins are added to the cement. They will make the linoleum tough and waterproof

The cement is now aged for several weeks in the storage bin where it becomes like dough and increases in toughness

Ground cork, wood flour, and color pigments are added to the dough in the mixer From the mixer it drops onto a burlap strip that forms the back of the linoleum

Big rollers in the calender press the materials to the proper thickness and width.

LINOLEUM is a trade name for the waterproof floor covering most often used in kitchens. It gets its name from the large amount of linseed oil used in it. Linoleum is made chiefly of powdered cork and linseed oil spread over a background of burlap. Linseed oil exposed to air forms a rubbery film. This film is mixed with cork, kauri gum, resin, and sometimes color pigment. Then it is spread evenly over the burlap, and pressed.

Manufacturers produce three thicknesses of linoleum. The thickest is called *battleship linoleum*, because it was first used on the decks of warships. Battleship linoleum is so heavy that four sheets of the material will make a floor covering 1 inch thick. Ordinary linoleum for household use on floors is only half as thick as battleship linoleum. The thinnest linoleum is used on table tops, counters, walls, and other surfaces that need a light, waterproof covering.

There are three chief kinds of linoleum: plain, inlaid, and printed.

Plain linoleum comes in only one color. The pigment is mixed in with the linseed oil and other ingredients before they are applied to the burlap backing.

Inlaid linoleum may be made in many colors. It differs from ordinary printed linoleum because the design and color go all the way through the linoleum to the burlap backing. Inlaid linoleum is made by dyeing and shaping each part of the pattern separately, then pressing it on the burlap. There are two types of inlaid linoleum. One has a pattern that is simply squares of different colors, like tile. The other has a molded pattern with a more elaborate design.

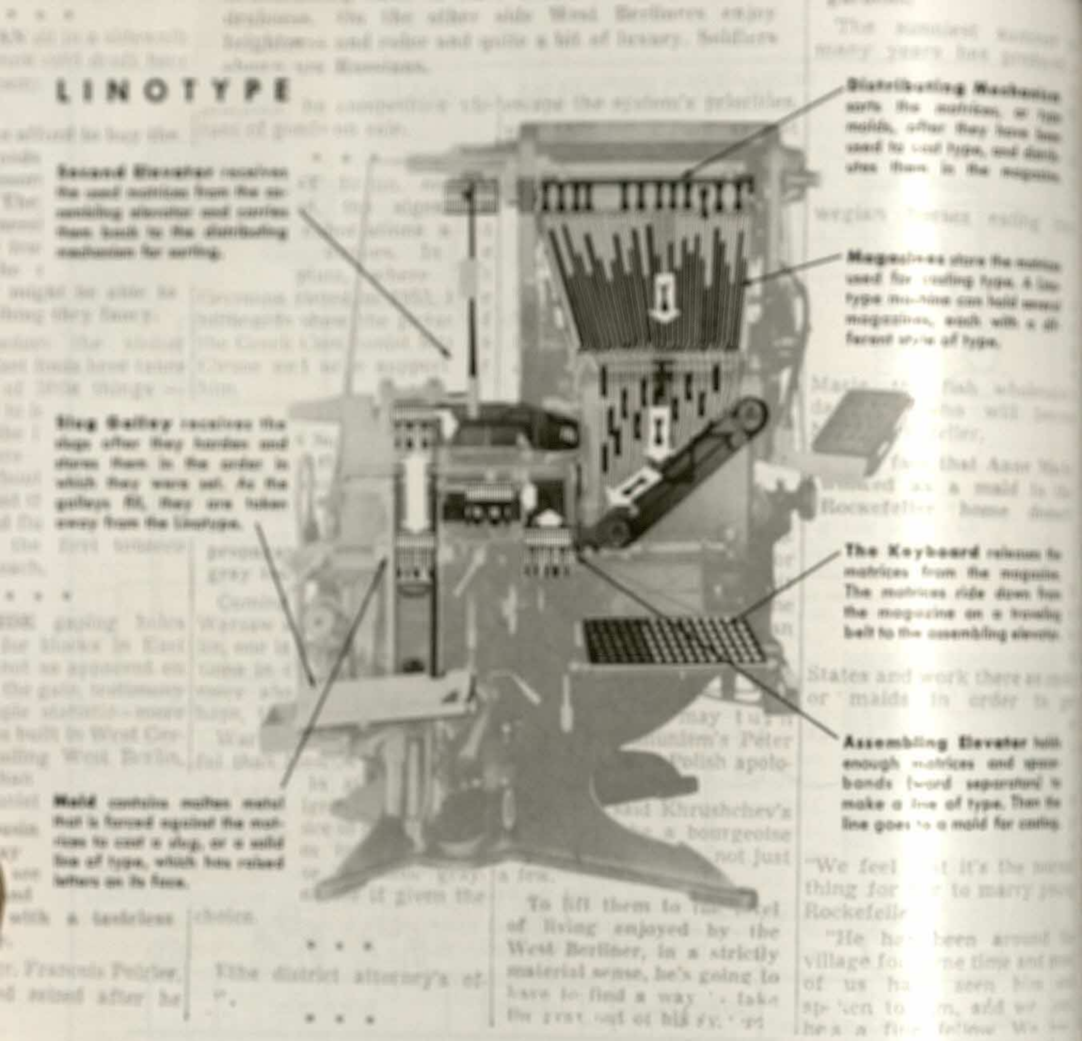
Printed linoleum does not have a pattern that goes through to the burlap backing. The design is applied with oil paints to the plain linoleum by presses.

Cork carpeting is a type of linoleum that contains very coarse powdered cork. It is used mostly in churches and libraries because it deadens sound.

A product called *vinyl linoleum* gained popularity after World War II. This material is also used to cover floors and walls. It is not a true linoleum, but is made from vinyl plastic (see VINYL). EFFA BROWN

LINOLEUM-BLOCK PRINTING. See BLOCK PRINTING.

LINOTYPE



Second Elevator receives the used matrices from the assembling elevator and carries them back to the distributing mechanism for sorting.

Slug Galley receives the slugs after they harden and stores them in the order in which they were set. As the galleys fill, they are taken away from the Linotype.

Mold contains molten metal that is forced against the matrices to cast a slug, or a solid line of type, which has raised letters on its face.

Distributing Mechanism sorts the matrices, or type molds, after they have been used to cast type, and distributes them in the magazine.

Magazines store the matrices used for casting type. A Linotype machine can hold several magazines, each with a different style of type.

The Keyboard releases the matrices from the magazine. The matrices ride down from the magazine on a traveling belt to the assembling elevator.

Assembling Elevator holds enough matrices and spacebands (word separators) to make a line of type. Then the line goes to a mold for casting.

LINOTYPE, *LINE oh type*, is a machine for producing printing type. Its name comes from its product, a solid line, or *slug*, of raised letters in a line—a line of type. The production of this slug involves a number of operations, most of them performed automatically by the machine. A Linotype operator can set as much type as several hand compositors.

The operator sits before a keyboard which resembles that of a typewriter, but has 90 keys. He touches a letter key that releases a brass mold, or *matrix*, from the metal case, or *magazine*, at the top of the machine. A moving belt carries the matrix to its proper place in the line. Spaces between words are formed by wedge-shaped spacebands, which are automatically inserted when the operator presses a key.

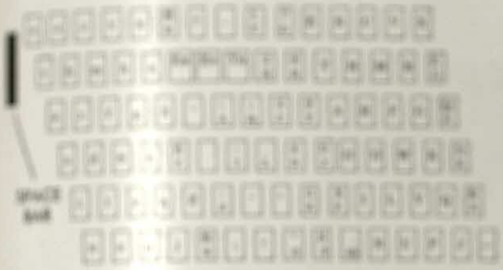
When the operator has composed the line of matrices they are transferred to the casting mechanism. Here they are automatically spaced, or *justified*, and molten metal forced into the faces of the matrices. The metal hardens into a slug with raised letters formed on its face by the matrices. The Linotype then slides the line, or slug, into a shallow, sideless tray called a *galley*. The slugs are used to print books, newspapers, magazines, and a great many other kinds of printed materials.

The machine immediately and automatically returns the matrices to their proper places in the magazine where they will be used over and over again. The automatic distribution of matrices eliminates the need for distributing individual types by hand. The principle of casting type from matrices assures fresh new type for every printing.

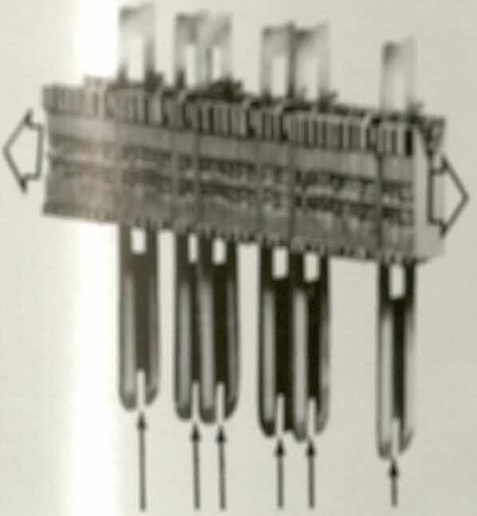
Ottmar Mergenthaler patented the Linotype in 1884. It went through many stages of experimental development and was first successfully used commercially in New York City by *The Tribune* in 1886. Many improvements have been made on the machine since then. The present Blue Streak Linotypes can set type in all sizes from the very smallest to the larger display sizes and in thousands of designs, or *faces*. More than 850 languages and dialects are set on Linotype machines in all parts of the world.

The *Linofilm* is a machine that photographically places letters on film or paper. Printers call this process *cold type*. Slugs are called *hot metal*. EDMUND C. ARNOLD

See also MERGENTHALER, OTTMAR; MONOTYPE; PRINTING (Setting the Type).



The Linotype Keyboard, *left,* has a different arrangement of keys from that of a typewriter. A Linotype operator, *right,* can set an average of about 120 separate characters a minute.



A Line of Matrices, *above,* includes wedge-shaped spacebands that form the spaces between words. To make a line the proper width, the spacebands may be pushed up to enlarge the spaces.

Finished Lines of Type, or Slugs, *right,* come from the Linotype. The slugs are solid pieces of metal with raised characters on one side.

Mergenthaler Linotype Co.

LINSEED OIL is obtained from the seed of the flax plant. It is used chiefly in the manufacture of paints. The oil takes up oxygen from the air and dries best if it is spread in thin coats. The tough skin formed by the dried oil does not break or chip, and resists changes in the weather. These qualities make the oil particularly valuable in paints which must stand all kinds of weather.

Linseed oil is usually obtained from flaxseed by a process called *compression.* The seeds are first ground into a meal. The meal is heated and pressed in cakes. These cakes are then squeezed tightly in hydraulic presses. The oil which comes out is purified by straining. Sometimes linseed oil is extracted from flaxseed by a volatile solvent. After *extraction,* the solvent is allowed to evaporate, leaving the pure linseed oil.

The *cake* which is left when the oil is removed is made into food for farm animals. In addition to its use in paint, linseed oil is used in the manufacture of oilcloth, linoleum, varnish, and enamel. Cities that have linseed oil mills include Buffalo, N.Y.; Chicago; Milwaukee and Superior, Wis.; and Minneapolis and St. Paul, Minn.

John R. Koch

See also FLAX; LINOLEUM.

LINSEY-WOOLSEY is a rough cloth made of linen and wool. It is hand-woven and hand-spun with the linen threads running lengthwise to form the *warp,* and the wool running crosswise to form the *filling.* Linsey-woolsey was made by the early colonists of the United States and by pioneers of the West until after the Civil War. They used linen threads because they did not have enough wool.

Grace G. Denny

LINT. See COTTON (Cotton-Fiber Products; Classing).

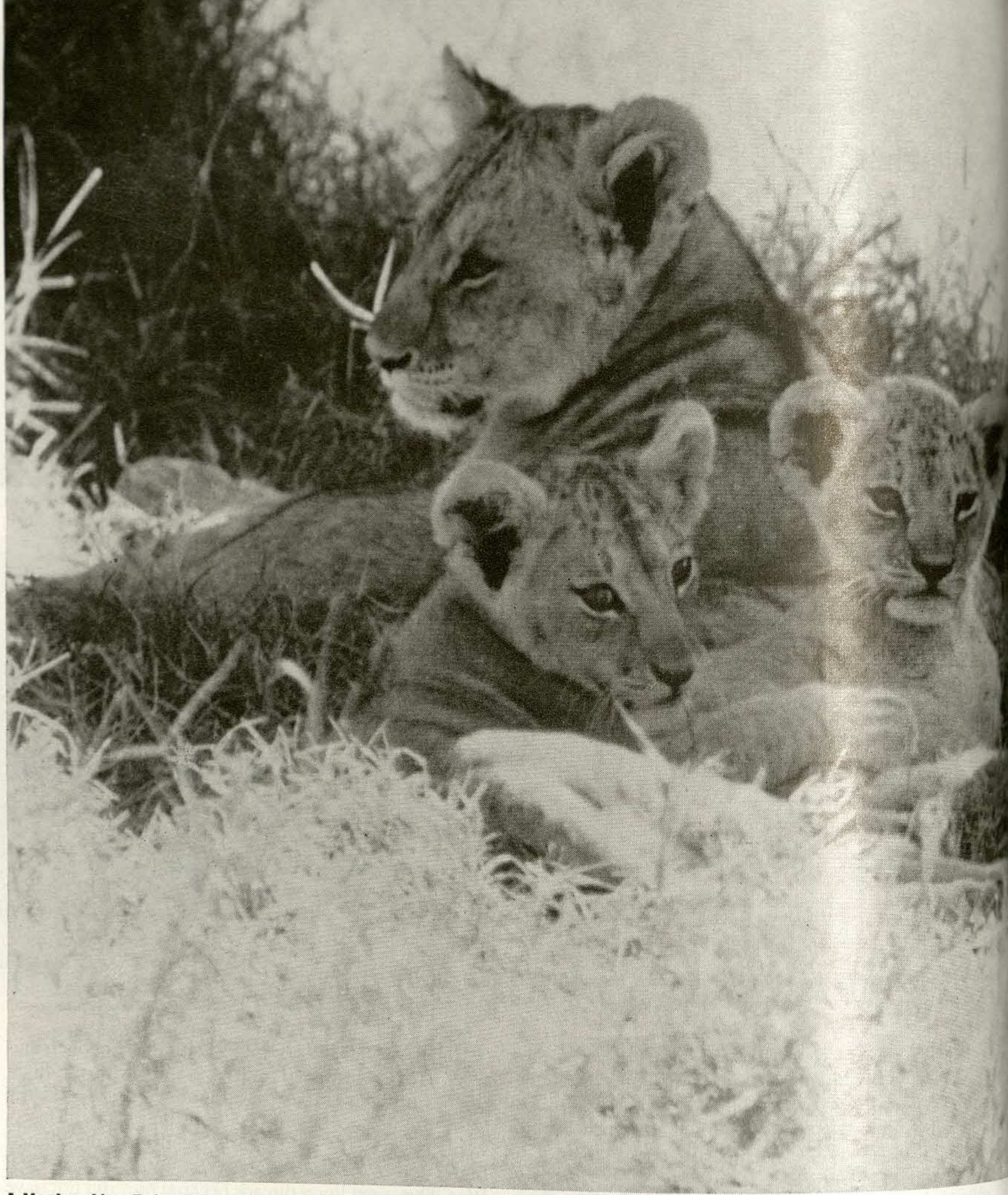
LINTEL. See ARCH; ARCHITECTURE (Architectural Terms; picture, Post and Lintel).

LINTERS. See COTTON (Uses of Cotton).

LINTON, RALPH (1893-1953), an American anthropologist, developed theories about the nature of human culture and the influence of culture on personality. His work is considered of fundamental importance to anthropology, as well as to all the social sciences. Linton's three most influential books are *The Study of Man* (1936), *The Cultural Background of Personality* (1945), and *The Tree of Culture* (1955). He was born in Philadelphia, and taught at the University of Wisconsin and at Columbia and Yale universities.

David B. Stout

LION, in astronomy. See LEO.



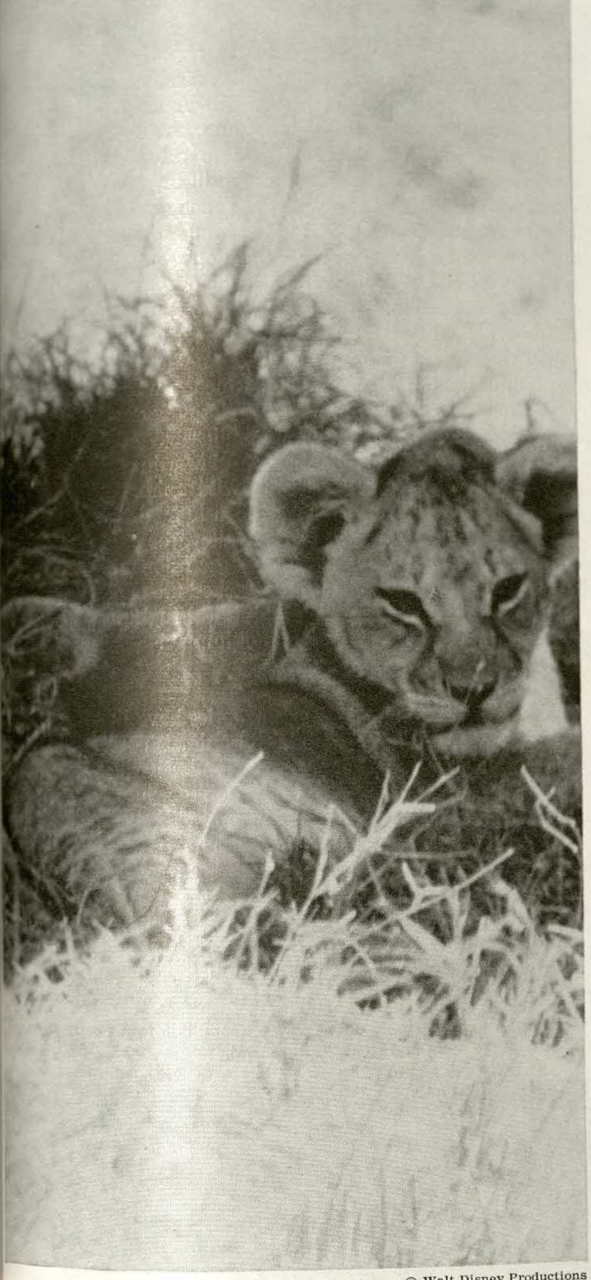
A Mother Lion Takes Good Care of Her Cubs until they are well grown. The male also helps in caring for the family. Baby lions are as playful as kittens, but as they grow, their wild instincts develop and they become strong and ferocious.

LION, with its heavy mane and terrible roar, is probably the most famous member of the cat family. It is a relative of the tiger, leopard, puma, and lynx, as well as of the friendly domestic, or "house," cat. The lion and the tiger are the largest animals in the cat family, and the tiger is the fiercer of the two. But the lion ranks among the strongest and fiercest of all wild creatures.

Although the tiger looks different from the lion, their bodies are actually very similar. In fact, lions and tigers may mate, producing a hybrid animal, half lion and half tiger, just as a mule is half horse and half donkey. The hybrid may be called a *tiglon*, a *tigon*, or a *liger*.

The lion is commonly known as the "king of beasts" and the "lord of the jungle," although it seldom lives in the thick jungle. The lion's powerful body and large head, and the long mane of the male, give it a proud and kingly appearance. It preys on many different animals, and its ferocity and roar make it a terror among them.

In early historic times, many lions lived in eastern Europe as far north as Romania, in southern and southwestern Asia, and throughout Africa. Civilization has steadily driven them back into the wild regions. Today, no lions remain in Europe, Asia Minor, Arabia, or Egypt. They have almost disappeared from India. Indian lions live only in the 500-square-mile Gir Forest near the west coast. Naturalists believe that only 70 or 80 lions remain in India. African lions roam throughout



© Walt Disney Productions

the continent south of the Sahara Desert, except for the western and central forests and the settled areas. In the regions where many persons live, hunters have killed off all the lions. The lions prefer to stay in the plains and in scrub or thorn forests. In open country, their tawny coats blend well with the rocks and sandy background. They do not wander into heavy forests and jungles. They do not inhabit the heart of the desert areas, because of the scarcity of game.

The Life of a Lion

Body. The largest lions grow 45 inches high. They are more than $9\frac{1}{2}$ feet long from the nose to the tip of the tail. They may weigh more than 500 pounds. But most lions are about two thirds that size. The lion's tail is about half as long as its body. The male's tail ends in a brush of black hair. In the center of this brush of hair grows a small horny appendage. This appendage is known as the "thorn" in the lion's tail. The brush of hair and the mane are features that set the lion apart from other members of the cat family. Only male lions have a mane. The mane begins to grow when the animal is 3 years old. Besides being a mark of sex, it serves as a shield to protect the king of beasts in its fierce combats. Captive lions usually have the thickest and longest manes. Sometimes contact with the thorny shrubs in which it lives will almost entirely wear off the mane of a wild lion.

The usual color of the lion's coat is a yellowish brown. Some lions have reddish coats, and occasionally a black lion appears. The lion's mane is usually darker than its coat, and may have blackish patches. Young cubs have black spots on their thick woolly fur, but these spots usually disappear within six months after birth. Occasionally the thick baby coat may last two or three years before the thin hairy covering of the adult animal replaces it.

Life Cycle. A lion reaches its full growth at the age of 5 or 6, and usually lives from 20 to 25 years in captivity. Some lions have lived 30 years or longer. The lion begins to breed in its second year.

Habits. The lion makes its *den*, or lair, in some hidden spot. It chooses a dense thicket or patch of reeds, a group of rocks hidden by thick brushwood, or a cavern protected by thorns. The *whelps*, or cubs, are born in the den in the spring. A lioness may have up to six cubs in a litter. But most wild lionesses have only two or three. Well-fed zoo mothers have larger litters than wild lionesses. Lion cubs are born with their eyes fully open. The male helps take care of the whelps until they are well grown. The cubs begin to follow their mother, and sometimes their father, to the hunt when they are five or six months old. A male lion may remain with the same mate for a long time, perhaps permanently. Or he may have several mates at the same time. If so, they all live together in a large family group.

Food. Lions usually sleep in their lair part of the day. They come out to hunt chiefly at night, though hunger will bring them out during the day. They often lounge about in the shade of a tree during the heat of the day. They hunt antelopes, zebras, wild asses, wart hogs, bush pigs, and young elephants, rhinoceroses, hippopotamuses, and giraffes. Healthy full-grown elephants, giraffes, and other large mammals are generally safe from the lion. In regions where men have greatly reduced the population of wild game, lions may attack domestic cattle, goats, pigs, ponies, and camels.

How a Lion Hunts. Lions have terrible weapons in their powerful forelegs, which generally measure about 19 inches around, and their great feet, which are armed with sharp horny claws. Their paws have been said to strike a blow like a steam hammer. The lion kills small victims with a single blow by breaking the neck, or by tearing open the throat. It brings down a large animal by breaking its neck. The lion grasps the victim's nose with a huge paw, and jerks back its head. In some cases, the lion may fasten its teeth in the blood vessels of the victim's throat. Lions often hunt in groups, called *prides*, of 4 or 5, or even as many as 23 members. When several lions take part in a slaughter, the adults usually devour the "lion's share of the feast." The young help themselves to anything that may remain. When game becomes scarce, this practice often results in the slow starvation of many younger lions. In this way, the lion population remains within the bounds of the food supply, and lions do not exterminate their prey.

The lion is generally supposed to be fearless, as one would expect the king of the animals to be. Yet it has the instincts of a house cat and hunts much like the cat. It sometimes waits in ambush near a water hole for its prey. But generally, the lion stalks its prey until it comes close enough for a short, bounding rush. A lion has been known to spring more than 21 feet. The short rush of a charging lion is swift, but the lion cannot sustain its speed for any great distance. Some stories tell about the bravery of the lion. But others show that it is cowardly. There are tales of how it scorns any food that is not freshly killed, and others relating how greedy it is. The truth seems to be that a lion will eat anything that it can find. It may even eat rotten meat, if it feels like it or is hungry enough. Very old lions live on rodents, scorpions, and other small animals.

In general, lions do not attack man unless molested. But individual animals may become man-eaters when wounded, diseased, or excessively hungry. They usually attack only at night.

Hunting Lions

Readers of big-game literature know that lion hunting ranks among the most exciting of all sports. President Theodore Roosevelt, in his book *African Game Trails,* said that he ranked the lion as a hunter's most dangerous opponent under ordinary conditions. The most common method of hunting the animal is to drive it from its lair and fight it in the open. A hunter must fire accurately at a charging lion, and must keep firing as long as the animal seems able to advance. The wounded beast will almost certainly kill anyone it can reach with its teeth and claws. It has enormous vitality. Lions have even mauled and killed hunters after being shot through the heart. A shot into a lion's brain, which is about the size of a tennis ball, is the only method of dropping the animal in its tracks. Sportsmen use repeating rifles when they hunt lions. They hunt on foot, rather than on horses or elephants. Some hunters track the lion in the jungle, or wait for it near a water hole. These methods call for fighting at close quarters, and are considered dangerous or even foolhardy.

When the explorers Carl Akeley and Martin and Osa Johnson went to Africa to study wild animals, they found that lions that have never been hunted by man do not usually attack him. In one valley, the explorers spent two days in the midst of a dozen lions, photographing them. The lions never attacked the explorers. The Africans watching from a high hill thought the explorers had some power that was not human.

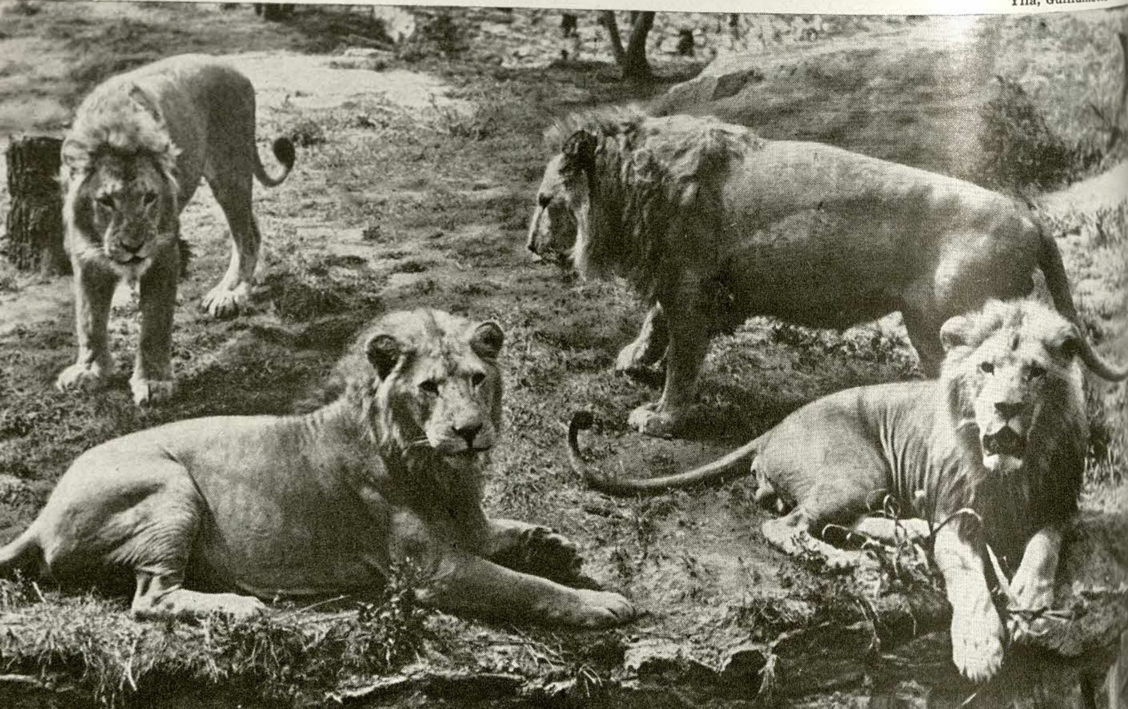
Lions in Captivity

Almost all zoos and circus menageries have lions as featured attractions. As these lordly animals pace restlessly up and down, visitors may wonder if they are thinking of their far-off home in the desert or jungle. As a matter of fact, most captive lions now in zoos probably never saw the lands of their ancestors. They breed well in captivity, and most captive lions were born in zoos. Zoo life does not seem to make lions less ferocious or weaker. Zookeepers feed lions raw beef. They scrub and disinfect the wooden floors of the steel cages daily. Cubs born in a zoo are as playful and affectionate as

The Powerful Forelegs of the Lion can strike a mighty blow. In hunting, the lion uses them like clubs to knock down its prey.

Lions prefer to live in fairly open country where their tawny coats blend with the rocks and sandy background.

Ylla, Guillumette



Chicago Sun-Times; Yila, Guillumette

Lions Adapt Easily to Life in a Zoo. They keep their great strength, and breed readily in captivity. Playful lion cubs especially delight zoo visitors with their amusing tricks.

kittens, but as they grow older they soon become too rough to handle.

Lions have enough intelligence to learn interesting tricks and to take part in circuses. Trainers spend long hours teaching lions to do such tricks as climbing upon small stands, climbing stairs, or jumping through hoops. An occasional lion trainer even puts his head in a lion's mouth. A trained lion act thrills most people because it is so dangerous. Even the most "friendly" lion is basically wild, and can never really be trusted. Angry animals have clawed their trainers, inflicting terrible injuries or even killing them.

A few persons have kept lions as house pets, but the owners must always be extremely careful with the animals. The lions play roughly and knock over furniture. They may accidentally cause serious injury even in good-natured play.

Lions in Story, Art, and History

No other wild animal has appeared so often in story, art, and history as the lion. The familiar story of "Androcles and the Lion" was a favorite among the ancient Romans. Androcles was a slave who ran away from a cruel master and hid in a lion's den. While there, he removed a thorn from the beast's foot. Years later, Androcles was commanded to go into the arena at Rome to fight a fierce lion. Instead of leaping upon him, the animal behaved like a pet dog. It was the same beast he had once befriended. Slave and lion were then allowed to leave the arena, and were later exhibited in the streets. George Bernard Shaw, the famed dramatist, used this story for one of his wittiest plays, *Androcles and the Lion*.

The lion is mentioned frequently in the Bible. The best known of these stories is about Daniel, the Hebrew captive at Babylon. Daniel was thrown into a den of lions because he persisted in praying to God. But the lions would not harm him. The story is told in Daniel 6. In I Peter 5: 8, Satan is compared with a roaring lion that goes about "seeking whom he may devour." According to Psalm 10: 9, the wicked lie in wait secretly "as a lion in his den."

From the days of the ancients, the lion has had an important place in art and heraldry. It has appeared in sculpture and on medals and flags. Rosa Bonheur and others have painted it in oil. Today, it is the emblem of Great Britain. A red lion *rampant*, or standing on his hind legs, occupies the upper right-hand quarter of the royal standard. This flag flies when the monarch is present. Large sculptured lions guard the famous Nelson column in Trafalgar Square, London, the entrances to the New York Public Library and the Art Institute of Chicago, and many other structures. The famous "Lion of Lucerne," a huge lion carved in solid rock, commemorates the Swiss Guards who died defending the Palace of the Tuileries during the French Revolution.

There are many familiar expressions about the lion. King Richard I of England was called the *Lion-Hearted* because of his heroic nature. Lions were once kept in the Tower of London, and were one of the sights that visitors went to see. A "social lion" now means a person so popular in social life that everyone goes out of the way to see him. We say that they "lionize" him. An old story from Aesop's *Fables* tells about the lion that hunted with the fox and wolf, then claimed two thirds of the game. From this comes the expression "the lion's share." The *puma* is known as the *mountain lion* or *American lion*. It is related to the lion, but is not a true lion. The fifth constellation of the zodiac represents Leo, the lion. Astronomers of ancient times thought the arrangement of stars resembled the outline of a lion (see LEO).

Scientific Classification. The lion belongs to the family *Felidae*. It is genus *Felis*, species *leo*. VICTOR H. CAHALANE

See also ANIMAL (color picture, Africa); CIRCUS (color picture, Under the Big Top); JOHNSON (family); MOUNTAIN LION; PAINTING (picture, *The Lion Hunt*).

LION OF LUCERNE. See LUCERNE; SWISS GUARDS; THORVALDSEN, BERTEL.

LION OF THE NORTH. See THIRTY YEARS' WAR (The Swedish Period).

LIONS CLUBS, INTERNATIONAL ASSOCIATION OF, usually called *Lions International*, ranks as the world's largest service club organization. It has over 15,000 clubs and more than 600,000 club members in over 100 countries. Lions Clubs are associations of business and professional men who seek to recognize and meet the needs of their communities. Club activities fall into 10 groups: boys' and girls' activities, citizenship and patriotism, civic improvement, community betterment, education, health and welfare, safety, sight conservation and aid to the blind, agricultural needs, and United Nations and international affairs.

The association was founded on June 7, 1917, in Chicago. It held its first national convention in Dallas, Tex. By 1920, the association had doubled its membership, and set up clubs in Canada. Other clubs were later established in China, Cuba, Hawaii, and Mexico. The association has an annual convention. It publishes the *Lion* magazine and a Spanish edition, *El León*. It has headquarters at 209 N. Michigan Ave., Chicago 1. HARRY J. COOPER

See also KIWANIS INTERNATIONAL; ROTARY INTERNATIONAL.

Lions Clubs Emblem

LIP. See RACES OF MAN (picture, Main Characteristics; table, Principal Physical Characteristics).

LIP READING is the technique by which one person understands the speech of another without hearing any sounds. He does this by watching the other person's mouth, and observing the shape it makes as each word is pronounced. Lip reading is sometimes called *speech reading*. It is widely used by persons who are deaf or hard-of-hearing.

Lip reading was used in the 1500's by the earliest teachers of the deaf. In 1778, Samuel Heinicke helped establish lip reading as a part of the German system of teaching the deaf. In 1843, the American educator, Horace Mann, observed methods of lip reading used in Germany, and urged that these techniques be adopted in the United States to provide a means of understanding the spoken word for the country's deaf and hard-of-hearing persons. Mann's proposals eventually led to the establishment of the first lip-reading school in the United States in 1867.

Today, all schools for the deaf emphasize lip reading. Most cities offer lip-reading instruction. Many public-school systems provide lip-reading instruction.

It is not easy to become a skilled lip reader. One of the difficulties is that the lips move rapidly, even during an ordinary conversation. Certain words, such as *nine* and *died*, cause confusion, because they appear as the same word on the lips. Other words, such as *under* and *easy*, cause trouble because they require little or no motion of the lips. If such difficulties are overcome, deaf and hard-of-hearing persons can communicate with others easily, however, and without the use of sign language. E. B. BOATNER

See also HANDICAPPED, THE; HEARING AIDS.

LIPASE. See ENZYME.

Lennart Nilsson, Black Star

A Child Learns Lip Reading by sight, touch, and amplified sound. The pupil feels vibrations on her throat and that of the teacher, watches the lips and tongue in a mirror, and hears through a sound amplifier.

Paul Weller

Jacques Lipchitz often used complicated, interweaving forms and contrasting rough and smooth surfaces, as in the sculpture *Virgin*.

LIPCHITZ, JACQUES (1891-), an outstanding sculptor, gained fame for his designs in bronze. In the 1920's, he began to experiment with designs which he called "transparents." His work in the 1930's showed the same sharp lines and planes, but was more closely knit, although still free in organization. Lipchitz' works include *Song of the Vowels*, *Prometheus I*, *Prometheus II*, *Virgin*, and *Spirit of Enterprise*.

Lipchitz was born in Druskieniki, Lithuania, of Jewish parents. He began studying sculpture in Paris. There he met Pablo Picasso and Juan Gris, and experimented for a time with Cubist sculpture. Lipchitz moved to New York City in 1941, and became a United States citizen in 1957. CHARLES SEYMOUR, JR.

See also SCULPTURE (picture, Modern Sculpture).

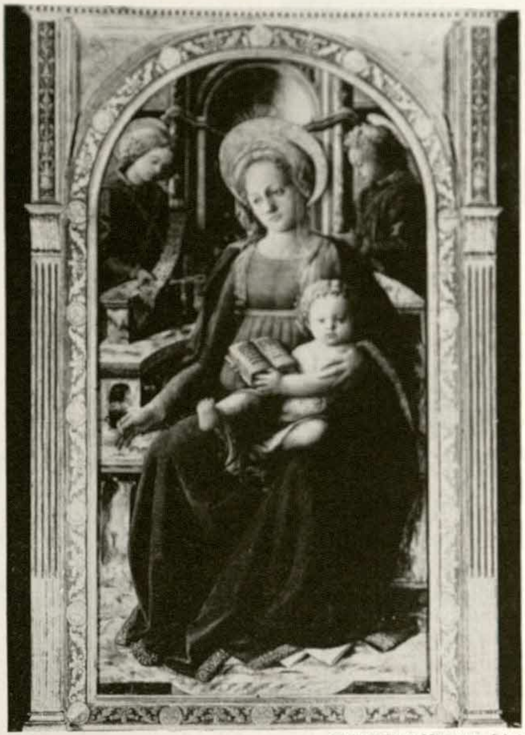
LIPMANN, FRITZ ALBERT (1899-), an American biochemist, shared the 1953 Nobel prize in medicine and physiology with Hans Adolph Krebs. Lipmann won for his isolation and identification of coenzyme A. He worked at Rockefeller Institute from 1931 to 1932, and for seven years in Copenhagen. After his return to the United States, he became professor of biological chemistry at Harvard University in 1949. Lipmann was born in Konigsberg, Germany, and was graduated from the University of Berlin. HENRY H. FERTIG

LIPOMA. See TUMOR.

LIPPERSHEY, HANS. See TELESCOPE.

LIPPI, *LEEP pee*, or *LIP ih*, was the family name of two Italian painters of the Florentine school, father and son. They achieved popularity during the Renaissance.

Fra Filippo Lippi (1406?-1469), the father, first painted in the monumental style of Tommaso Masaccio, an Italian painter. Lippi's later works are more gentle and intimate. His frescoes picturing scenes from the lives of John the Baptist and Saint Stephen are in the Cathedral of Prato, Italy.



Metropolitan Museum of Art

***The Madonna and Child* by Fra Filippo Lippi** has a warm human quality for which the great Italian painter was famous. Lippi's son Filippino was also a celebrated artist.

Filippino Lippi (1457?-1504), reflects the line rhythms of Botticelli and the shadowy tones of Leonardo da Vinci in his work. His *Adoration of the Magi* is in the Uffizi Gallery in Florence. CREIGHTON GILBERT

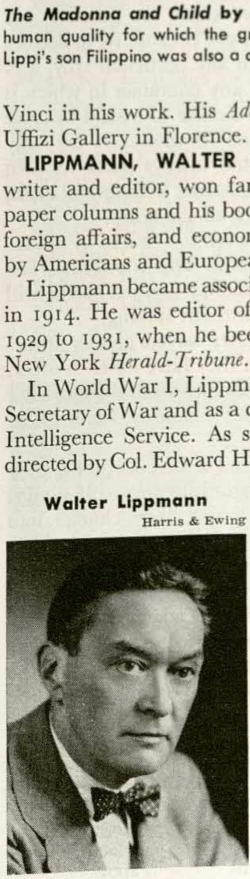
LIPPMANN, WALTER (1889-), an American writer and editor, won fame for his syndicated newspaper columns and his books. His writings on politics, foreign affairs, and economics have been widely read by Americans and Europeans alike.

Lippmann became associate editor of the *New Republic* in 1914. He was editor of the New York *World* from 1929 to 1931, when he became a special writer for the New York *Herald-Tribune*.

In World War I, Lippmann served as assistant to the Secretary of War and as a captain in the Army Military Intelligence Service. As secretary to an organization directed by Col. Edward H. House, he prepared data for the Peace Conference in 1918-1919.

Walter Lippmann

Harris & Ewing



Lippmann's books include *A Preface to Morals* (1929), *The Method of Freedom* (1934), *United States Foreign Policy: Shield of the Republic* (1943), *The Public Philosophy* (1955), and his study of Russian-American relations, *The Communist World and Ours* (1959).

Lippmann was born in New York City, and was graduated from Harvard University. I. W. COLE

Lisbon, Portugal, overlooks the mouth of the Tagus River. Streets in the new part of the city are wide and straight, but those in Old Lisbon are crooked and crowded. Many are not wide enough for automobiles.

Williams, Black Star

LISBON, *LIHZ bun* (pop. 783,226; met. area, 1,100,000), is the capital and largest city of Portugal. Its name in Portuguese and Spanish is LISBOA. Lisbon has one of the world's finest harbors.

Location and Description. Lisbon lies about two thirds of the way down Portugal's western coast, overlooking a broad bay formed by the estuary of the Tagus River. It is about seven miles inland from the Atlantic Ocean. For location, see PORTUGAL (color map). The city stretches along the waterfront of the estuary, called the *Mar de Palha*, and rises from a low range of hills that climb to the granite Cintra range behind Lisbon. Many streets wind steeply up the foothills of the mountains. Lisbon is divided into five *bairros*, or sections. The oldest, Lisboa Oriental, includes the castle of São Jorge, the Cathedral (erected between 1344 and 1380), the Church of São Vicente de Flora, and an Augustinian monastery that contains the tombs of the royal house of Portugal. The streets in this section are crooked and crowded. The other sections of Lisbon (Cidade Baixa, Lisboa Occidental, Alcántara, and Belém) have broad tree-lined avenues, parks, wide plazas, and beautiful public buildings. Some of the best known are the Teatro Nacional Almeida, Teatro São Carlos, the palace of the *Cortes* (parliament), and the former royal palace, now used as the ministry of the exterior. The famous Monastery of Jeronimos de Belém stands in the suburb of Belém. It was begun in 1500 as a monument to Portugal's great seamen, and is the burial place of the country's most famous men. The Palacio de Belém, built in the 1700's, has at times served as the seat of the republic's president.

Commerce and Industry. Lisbon's harbor is the main point of export for Portugal's salt, canned sardines and tuna, olive oil, and wine. Shipyards, a naval arsenal, and tobacco, food, ceramic, textile, and metalworking industries also operate in Lisbon. Lisbon is a terminal for steamship lines, and has a large airport.

Cultural Life. The city is the home of Lisbon University, founded in 1911, and the Higher Technical Institute, established in 1930. Special music and art colleges, and training schools for the army and navy are also in the city. Lisbon has an ethnographical and colonial museum, an art museum, a modern art museum, and an archaeological museum. The Biblioteca Nacional de Lisboa, founded in 1796, has the largest book collection in the country.

History. In ancient times, Lisbon was a Greek trading place and later a Roman *municipium*. It was occupied by the Visigoths in the early Middle Ages, and later by the Moors. Afonso I reconquered the city from the Moors in 1147, and during the next few hundred years Lisbon developed as the capital of the kingdom and as a trading center. It declined in importance during a period of Spanish occupation from 1580 to 1640, but regained its prosperity after the Peace of Lisbon was signed in 1668. The earthquake of Nov. 1, 1755, destroyed two thirds of the city and killed more than 40,000 persons.

During the late 1800's, Lisbon became a center of the unrest that was widespread throughout Portugal. This unrest continued after the establishment of the republic in 1910. The city again became a center of international political and diplomatic activity during World War II, because it was a neutral capital. CHARLES E. NOWELL

LISGAR, BARON (1807-1876), JOHN YOUNG, served as governor-general of Canada from 1869 to 1872. During his administration, Manitoba and British Columbia entered the Dominion, the Treaty of Washington was signed, and plans were made for building the Canadian Pacific Railway. Lisgar served in the House of Commons more than 20 years. He became Lord High Commissioner of the Ionian Islands in 1855, and governor of New South Wales in 1861. Lisgar was born in Bombay, India, and studied at Oxford. LUCIEN BRAULT

LISLE, *lile*, is fine thread in which two combed yarns made from long strands of cotton are tightly twisted together and passed over gas jets to burn off fuzzy ends and to give the thread a smooth surface. The first lisle was made of linen. Most of it came from Lille (formerly Lisle), France, from which the thread gets its name. Lisle is used to make knitted garments, gloves, hosiery, and underwear. ERNEST R. KASWELL

LISPING is a speech defect. Persons who lisp have difficulty pronouncing *sibilant*, or hissing, sounds, such as *s* or *z*. They may substitute other sounds, or omit or distort these sounds. For example, in the sentence "I see my sister," a person who lisps may substitute *th* for the *s* sounds and say "I thee my thithter." Another person may omit the *s* altogether and say "I -ee my -i-ter." Still another may distort the *s* into a whistling sound instead of the normal hiss.

Many children lisp when they first begin to speak. During normal speech development, most children master the hissing sounds long before school age. But sometimes a child's speech development may be delayed. Various things can cause such delays. Among these may be loss of hearing; and defects of mouth structures, particularly the tongue, teeth, and palate. Almost all children lisp when they lose their primary front teeth (see TEETH). Improper speech habits by parents, such as using "baby talk," may also delay a child's speech development.

When lisping results from mouth defects, the defects must be corrected before completely normal speech can be obtained. Speech therapists, who are specially trained to treat speech disorders, teach persons who lisp to speak correctly. The therapist trains the individual to recognize his own speech errors and then to form the sounds properly. MARTIN F. PALMER

See also SPEECH THERAPY.

LIST SYSTEM. See PROPORTIONAL REPRESENTATION.

LISTER. See CORN (Planting).

LISTER, SIR JOSEPH (1827-1912), BARON LISTER OF LYME REGIS, founded antiseptic surgery. Before his time, people dreaded surgery. The most trivial operation was likely to be followed by infection, and death occurred in up to 50 per cent of all surgical cases.

After Louis Pasteur discovered that bacteria caused fermentation, Lister in 1865 realized that the formation of pus was also due to germs. At first, he used carbolic-acid sprays to kill germs in the air, but later he realized that germs were also carried by the surgeon's hands and instruments. He insisted on the use of antiseptics on hands, instruments, and dressings. He also introduced the use of catgut ligatures in 1880.

Brown Bros.

Joseph Lister

His application of antiseptics so revolutionized surgery that its whole history can be divided into two periods, pre-Listerian and post-Listerian. Mortalities fell to between 2 and 3 per cent of all patients operated on, and it became safe for doctors to open abdomens, chests, heads, and joints.

Lister was born at Upton, Essex, and studied medicine at University College, London. He served as professor of surgery at Glasgow University from 1860 to 1869, at Edinburgh University from 1869 to 1877, and at King's College, London, from 1877 to 1894. He was surgeon to Queen Victoria, and served as president of the Royal Society from 1895 to 1900. He was made a baronet in 1883, and was elevated to the peerage, the first medical man so honored, in 1897. HENRY J. L. MARRIOTT

See also ANTISEPTIC.

LISZT, *list,* **FRANZ** (1811-1886), was a Hungarian pianist, composer, and teacher. He wrote many works for the piano and orchestra, and is also remembered as the most celebrated pianist of the 1800's. He performed an invaluable service to the world of music as the teacher and sponsor of most of the brilliant musicians of his time.

His Life. Liszt was born in Raiding, Hungary. His father, a talented amateur musician, was his first piano teacher. The boy's musical talent appeared early. By the time he was 11, he had been presented in many parts of Europe as a child prodigy at the piano.

In 1823, Liszt went to Paris to study the piano systematically. The French recognized him as a brilliant performer with an almost uncanny ability to improvise on the keyboard. He had once wanted to become a priest, but decided instead to follow a career in music. He was inspired by the success of Nicolò Paganini to become as much a master of the piano as Paganini was of the violin.

Liszt quickly became a favorite of the wealthy in France, not only because of his talent, but also because of his fascinating personality. His generosity, his fine family background, and his ability as a writer and critic added to his popularity.

In 1830, when Liszt was 19, he met Frédéric Chopin, Hector Berlioz, and Paganini. A few years later, he became interested in the Countess d'Agoult, with whom he eloped to Switzerland. He was also romantically involved with the woman writer, George Sand.

Liszt made triumphal tours throughout most of Europe as a concert pianist, and he achieved tremendous success. In 1848, he retired to the German state of Weimar, where he had been appointed in 1842 as court music conductor. In Weimar, he began his brilliant career as a composer. He also conducted opera and concerts, and made the city the European headquarters for music. He sponsored the work of Richard Wagner and his new concept of musical theater (see WAGNER, RICHARD). While at Weimar, Liszt brought out Wagner's *Tannhäuser* and *Lohengrin*. He also produced *Benvenuto Cellini*, an opera by the French composer Hector Berlioz, as well as many other works.

Brown Bros.

Franz Liszt

The Princess Carolyne von Wittgenstein strongly influenced his career as a composer at Weimar. But in 1859, Liszt resigned his post there and went to Rome. In 1865, he joined the Franciscans, and was given the title of Abbé. From then on, he divided his time between Rome, Weimar, and Budapest, and began teaching piano and composition. Among his students were many who became great: Camille Saint-Saēns, Georges Bizet, Bedřich Smetana, and Rafael Joseffy.

In 1886, when he was 75 years old, Liszt made his last concert tour, playing at Paris, and at London for Queen Victoria. He died at Bayreuth, attending a Wagner festival. A statue at Weimar honors him.

His Works. Liszt's musical compositions have caused much controversy among critics. He had an obvious talent for melody and for colorful orchestration, and many have praised the brilliance of style evident in his piano music. But other critics have believed that he lacked great creative talent.

He is credited with developing the rhapsody as a form of serious music, although he was not the first to compose one. The *Hungarian Rhapsodies*, in which he used gypsy music and folk-dance themes, are among his best-loved compositions. He also made popular the symphonic poem. He developed the *leitmotif*, or recurrent theme, used later by Wagner and Richard Strauss. His performances as a solo concert pianist set a style for such concerts which is still followed.

Liszt's works include two piano concertos, 14 symphonic poems, among which are *Les Préludes*, *Orpheus*, *Tasso*, and *Faust;* and the *Hungarian Fantasy*, for piano and orchestra. Of his piano music, the best-known pieces are the *Sonata in B minor*, ballades in A minor and B minor, three "Liebesträume," and "Deux Légendes."

His transcriptions of the work of other composers include Johann Sebastian Bach's *Fantasia and Fugue in G minor* for organ, six of Bach's organ preludes and fugues, and "Grandes Études de Paganini," from Paganini's "Caprices." HANS ROSENWALD

LITANY, *LIT uh nih,* is a form of prayer-dialogue in which the worshipers take responsive parts. The minister or priest recites its separate sentences, and the congregation "responds." A litany may be said at any religious service as a request for grace and mercy, or for deliverance from danger, pestilence, or sin. The three litanies most commonly said in the Roman Catholic Church are the *Litany of Saints*, the *Litany of the Holy Name of Jesus*, and the *Litany of the Blessed Virgin*. The Eastern Orthodox, the Anglican, the Episcopal, the Lutheran, the Reformed, and the Presbyterian are among other churches which include the litany in their worship services. MERVIN MONROE DEEMS and FULTON J. SHEEN

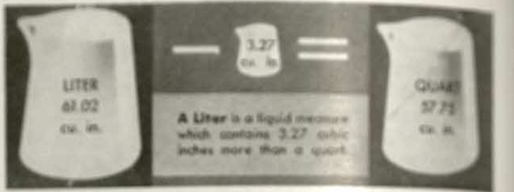
LITCHFIELD, Conn. (pop. 1,363; alt. 1,085 ft.), is a picturesque village in the hills of western Connecticut, settled in 1720. It has many well-preserved colonial homes, and lofty elms arch over its broad streets. For location, see CONNECTICUT (color map).

In 1776, a lead statue of King George III was brought to Litchfield from New York City and melted into more than 42,000 bullets for American soldiers in the Revolutionary War. A Litchfield lawyer, Tapping Reeve, established the first law school in the United States there in 1784. The small frame building that housed this school still stands. Students there included Aaron Burr and John C. Calhoun. ALBERT E. VAN DUSEN

See also CONNECTICUT (Interesting Places to Visit).

LITCHI, *LEE chee,* **LYCHEE,** or **LEECHEE,** is the name of an evergreen tree which is widely grown in southern China. It is occasionally grown in many other tropical and subtropical parts of the world. Commercial plantings of the litchi tree were begun in southern Florida, in the early 1940's. The tree has glossy light green leaves with several leaflets. It bears clusters of bright red fruits which look something like strawberries. The juicy white pulp which surrounds the single seed has somewhat the flavor of a muscat grape. This fruit is a great favorite among the people of southern China. Dried litchis are sometimes called litchi nuts.

Scientific Classification. The litchi is in the family *Sapindaceae*. It is genus *Litchi*, species *chinensis*. JULIAN C. CRANE



A Liter is a liquid measure which contains 3.27 cubic inches more than a quart.

LITER, *LEE tur,* is a measure of volume in the metric system. It equals 1.000028 cubic decimeters, or close to 1,000 cubic centimeters. One liter contains 61.025 cubic inches and is equal to 1.0567 U.S. liquid quarts and .880 quart in the English system. A can 3 inches square and 6.8 inches high holds about a liter of water. A liter is scientifically defined as the volume of a kilogram of water at its maximum density.

The liter is the official measure of liquid capacity in all Western Europe except Great Britain and Ireland, and in the Latin-American countries. E. G. [illegible]

See also METRIC SYSTEM.

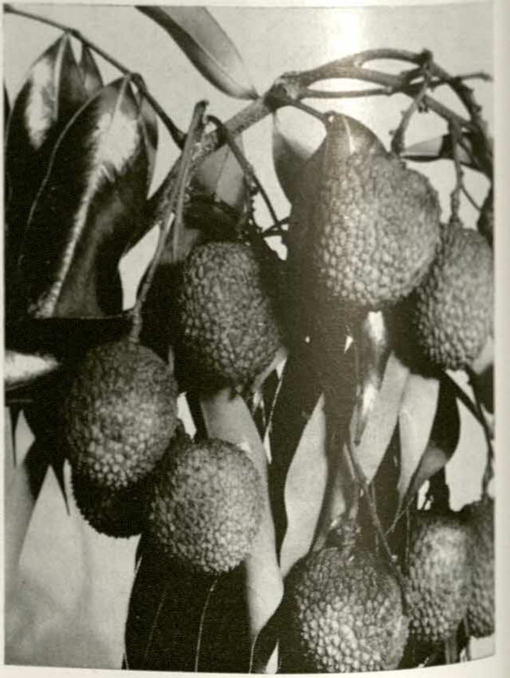
LITERACY means primarily the ability to read and write. It also means that a person is able to read, write, and use numbers skillfully enough to meet the demands of modern society. See also ILLITERACY.

LITERARY AWARDS. See CALDECOTT MEDAL; NEWBERY MEDAL; NOBEL PRIZES; PULITZER PRIZES; REGINA MEDAL.

LITERARY PROPERTY is anything that a writer expresses in written or printed words. Judges have described literary property as the exclusive right to "possess, use, and dispose of one's own intellectual production." In many countries, copyright laws protect literary property. See also COPYRIGHT.

The Fruit of the Litchi Tree Has a Sweet Flavor and is widely used as a food by Chinese and Japanese peoples.

J. Horace McFarland



LITERATURE

LITERATURE. No adding machine could count the number of words people use each day. We greet a friend, discuss the music made by the school band, or proudly describe the family's new automobile. Such conversations are quickly forgotten. We use today's newspapers to start tomorrow's fire. But some of the words which are spoken or written each day are worth keeping. They have value for the beauty of the ways in which they are used and for what they say.

Since the invention of written languages, men have worked to keep a record of worth-while sayings and writings. Early men hacked out in stone the teachings of their leaders. The glories of ancient Egypt were described in hieroglyphics or picture writing on the walls of tombs. In the Middle Ages, monks spent their lives copying manuscripts. Today, printing presses roll out books, newspapers, and magazines. The best of all that has been written we call *literature*.

Literature might be said to include everything that is written. Almost all the writings of early peoples we consider literature. But early peoples wrote down only the best of their spoken words. Writing was hard work and writing materials were scarce. The invention of printing from movable type in the middle 1400's made publication easy and cheap. Many things which are printed today cannot be called literature because they have no lasting value. Parts of the Bible are more than 3,000 years old, but the Bible is still the world's best seller. The works of Shakespeare are as popular today as they were when he wrote them 350 years ago. But the dime novels that our parents and grandparents read are not well known today as books. The Bible and the plays of Shakespeare appeal to peoples of all times because of the beauty of their language and the rightness of their thoughts. Dime novels and books like them appeal only to the passing fancy. Perhaps the best word in any language for literature is the French word *belles-lettres*, which means simply beautiful writing.

Literature and Civilization

Language is the means of most human relationships. Literature is the collection of the best uses of language. Thus it has played an important part in the development of human civilization.

Language. Literature is tied up with the development of language. Literature has helped language to grow. Writers have added new words and new ways of expression. Written language has helped to develop an accepted language. The rules of grammar are largely set by literary usages. Reading of literature improves the use of language by the people. The literature of foreign peoples adds words and phrases to one's own language.

Morality. Literature has always been a great teacher. Many of the early works of literature are religious and philosophical books. Most of the great religions are based on the writings in books. Christianity and Judaism are based on the Bible. Islam has the Koran. Confucianism has the writings of Confucius. Much of our modern thinking on moral and philosophical subjects has developed from the writings of such Greek philosophers as Plato and Aristotle. Literature serves as a base on which new thinking can be built.

History. Literature plays a great role in human history. The true greatness of a people at any period of history can be measured by their literature. Great peoples produce great literature. And great literature also helps to make a people great. The rise and fall of the Greek and Roman empires can be traced in their literary histories. A study of Chinese literature shows the sources of the strength and lasting qualities of Chinese life and civilization. The period when Germany was a world center of culture and progress was the time of the great literature of Schiller, Goethe, and, later, of Heine. The period when Germany came under the Nazis was a time of little civilization and produced only poor writing in Germany.

Literature has been responsible for many social and political changes. The Reformation spread through Europe with the writings of Martin Luther and John Calvin. The fires of revolution in America were fanned by the writings of Thomas Paine and by the Declaration of Independence. The novels of Émile Zola brought about many social reforms in France in the late 1800's.

Literature also has become one of the weapons of warfare. Many historians believe the speech in which President Woodrow Wilson outlined his Fourteen Points played a large part in bringing about the surrender of the German nation in World War I. The British people were heartened during the dark days of World War II by the speeches of Winston Churchill.

Human progress is always built on the past. Literature is a record of the past on which we can build the

Literature Was Greatly Affected by Aesop's Fables. The simple story form used by the legendary Greek fable teller has delighted readers for more than 2,000 years.

future. The downfall of the Roman Empire in the 400's cut off communications among the peoples of Western Europe. The great literature of Greece and Rome was lost or hidden away. Western civilization suffered a blow from which it did not recover for nearly a thousand years. By the 1400's, people were again studying Greek and Roman literature. The thought of men who had lived before the beginning of Christianity started men's minds working again. Europe awakened from its long sleep of ignorance to enter the age of progress called the Renaissance.

Literature is important in international relationships. Ideas have long been exchanged between peoples through their literatures. This is particularly true in present times. Literature is the connecting link which has made the civilization and culture of Europe and America one civilization which we call *Western*. The exchange of literature between countries has increased international understanding.

Kinds of Literature

As literature has developed, it has come to be divided into several groups. The two main divisions are poetry and prose. These are divisions of *form*. Until the late Renaissance, critics commonly considered all genuine literature as poetry. *Poetry* was any thought worded in a beautiful and appropriate form. Later, poetry came to mean literature in verse. Most verse is rhymed, but it does not have to be. It may have only a rhythm which sets it off from more ordinary writing. *Prose* is any kind of writing which is not poetry.

Prose and poetry are divided into other classifications, according to purpose. Poetry may be narrative, dramatic, or lyric. *Narrative* poems tell a story. They may be long epics, like the *Iliad*, or *Beowulf*. They may be collections of stories, like Chaucer's *Canterbury Tales*. Or they may be short stories like Alfred Noyes' "The Highwayman." *Dramatic* poems are plays in poetic form. Until the late 1700's, most plays were written in poetry. The Greek tragedies are poetry. Shakespeare's plays are a mixture of poetry and prose. The great French dramatists Racine and Corneille wrote in poetry, and some of Molière's plays also are written in verse. Some modern plays, such as Maxwell Anderson's *Night over Taos*, are in poetry. *Lyric* poetry is poetry which serves only to express a thought or feeling. Most modern poets use the lyric form, as did Wordsworth, Keats, and Shelley.

Poetry may also be classified according to form. There are many different forms. These are discussed fully in the article on POETRY. Some of these are the *rhyming couplet*, the *villanelle*, the *triolet*, and the *sonnet*. Not all poems fall into such classifications. Poets are not easily bound by fashion.

Prose may be classified according to form or to purpose. There is *fiction* and *nonfiction*. Fiction may be a *novel*, a *novelette*, a *tale*, or a *short story*. Fiction may also be in the form of a play. Nonfiction can be less easily classified. Much of it does not fit into any form. The *essay* is one of the common nonfiction forms.

Prose classes according to purpose include exposition, argument, description, and narration. *Exposition* states facts; *argument* sets forth opinions; *description* gives a picture in words; and *narration* tells a story. It sometimes becomes difficult to classify prose in these groups, because many prose pieces mix two or more forms. History is narration, but may also be regarded as exposition. Such works as THE WORLD BOOK ENCYCLOPEDIA are exposition. Most works of fiction use both description and narration.

History of Literature

Ancient Literature. We do not know what was the first piece of literature. The first known example of written language is dated about 4000 B.C. But literature as such did not begin until about 1500 B.C. Writings before that time are interesting only to historians. The first literature was produced among the peoples of Egypt, the Middle East, Persia, and China. The most important works of these early peoples to Westerners are the writings of the ancient Hebrews, which have been gathered together in the Old Testament. The books of the New Testament, of course, were written much later, at various times after the crucifixion of Jesus Christ.

Until modern times, people in Europe and America knew little about the early literature of Persia, China, and most of the Middle East. But recent studies have shown that the early literature of these peoples had considerable influence on our own early writings. Many of the fables of Aesop are from Oriental sources. Such Arabian stories as *Sinbad the Sailor*, *Ali Baba and the Forty Thieves*, and *Aladdin*, have been popular children's stories in the Western world for hundreds of years.

Greek Literature. Oriental and Hebrew literature have influenced European literature. But our literature really had its beginnings in Greece. In the period from 900 to 300 B.C., a civilization developed in Greece which has seldom been equaled in any nation or period. Much of the literary work of the ancient Greeks still ranks as the best in any language. Greek poems and plays have been studied and copied in all countries of Europe.

Many people regard Homer as the greatest of Greek literary figures. This poet produced two epic poems, the *Iliad* and the *Odyssey*, which remain today the greatest narrative poems ever written. For generations, until the study of Greek declined in the schools, Homer's stories of the fall of Troy and of the wanderings of Ulysses were familiar to every school child.

The Greeks also excelled in the writing of plays. The tragedies of Aeschylus, Sophocles, and Euripides were part of religious ceremonies in Greece. Their themes have been used often by later playwrights. The modern playwright Eugene O'Neill has modeled some of his plays on the Greek tragedies. Such of his plays as *Mourning Becomes Electra* are like Greek tragedies. The brilliant, mocking comedies of Aristophanes have been equally popular.

Greece also produced great lyric poets. The odes of Pindar and the love poems of Sappho have long been models for European poets. But perhaps the greatest of all Greek literature in its influence on Western civilization were the philosophical writings of such men as Plato and Aristotle. Their writings form the basis for much of the political and moral thought of the present day. Plato's *Republic* seems as fresh a study of the theory of government today as it was at the time it was written. Aristotle was the foundation of the most important school of philosophy and logic of the later Middle Ages. He was the teacher of literary critics and poets of the Renaissance, and has continued to influence writers of every generation.

Roman Literature. Rome replaced Greece as the leader of ancient Mediterranean civilization. Rome paid little attention to literature and the arts during the first years of its growth as a great ruling power. The Romans were too busy fighting wars and building cities. But Greek slaves were often brought to Rome to teach Roman children. The Romans paid greater attention to cultural development after their nation had become an empire and had begun to mellow in its richness and power. It was natural that Roman literature should copy Greek styles, because most of Roman learning came from Greece. Virgil's *Aeneid* was similar in form to Homer's *Iliad* and *Odyssey*. Ovid in his *Metamorphoses* retold many Greek stories. Plautus and Terence wrote in Latin many comedies based on Greek models. They did not even bother to use Roman characters and places. Seneca copied his tragedies after those of Euripides.

Perhaps the most popular examples of Latin literature are the speeches and writings of Cicero and Julius Caesar. These works are more clearly the product of Roman civilization than are many of the plays and poems. But they too have their Greek models. Cicero was a student of Greek philosophy. Caesar's accounts of his conquests follow the narrative style of Thucydides' *History of the Peloponnesian War*.

We must not think, however, that Latin literature was only clever imitation of Greek writing. The Romans did only what later peoples were to do. They took the works of earlier writers and used these forms to fit their own civilization. Roman literature has a great deal of freshness and gives an accurate picture of Roman civilization.

Middle Ages (400-1400). The Church replaced the Roman Empire as the chief guardian of civilization after Rome fell to the Goths in the 400's. Local governments were weak. Monks and priests replaced the Roman soldiers as the leaders. Literature was in the hands of the Roman Catholic Church, because almost all the educated men were churchmen. The Church paid most of its attention to religious and theological subjects. The poems and plays of the Greeks and Romans were largely forgotten, or else were given a Christian meaning.

During the early part of the Middle Ages, another occurrence prevented the writing of much important literature. Latin died out as a spoken language when communications broke down between Rome and the outlying parts of the Roman Empire. Latin remained, and still remains, the language of the Roman Catholic Church. But the people stopped using it in everyday conversation. Such languages as French, Italian, and Spanish grew out of Latin and displaced it. For many years, these languages were crude and scarcely fit for literature. The only literature of value was produced among the peoples outside the limits of the Roman Empire, who were becoming more civilized. We have Irish poems in the Gaelic language dating from the 700's. The Scandinavian *sagas*, or long epic tales of national heroes, were written in the later Middle Ages.

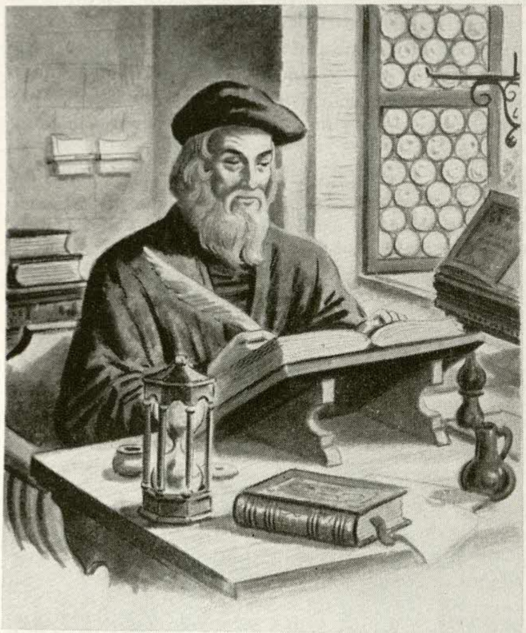
Works similar to the Scandinavian sagas began to appear in other European countries, beginning in the 800's. *Beowulf* was an epic poem about a great Anglo-Saxon hero. The *Song of Roland* honored a French warrior. It was written in the 1000's, and is the first im-

Literature and Learning Were Preserved by scholarly monks during the Middle Ages, which lasted nearly 1,000 years. Their beautiful books and scrolls were written and decorated by hand in the quiet of their monasteries.

portant French literary work. German poetry also began to develop at about the same time.

In the late 800's and early 900's two institutions arose in Europe which greatly affected the growth of literature — feudalism and chivalry. Feudalism organized Europe into many small but strong local governments. These governments rescued Europe from the disorders of the Dark Ages. Chivalry, the code of the warrior knights, gave Europeans a personal morality which they had almost lost in the savage darkness of the Middle Ages. Languages were also developing to the stage where they could be used in literature. Knights traveled to other countries and brought back new ideas.

The times were described in stories of love, of journeys into strange lands, of meetings with wizards, giants, and dwarfs. We call such stories *romances*. The stories were full of battle and bloodshed. But they also had a high moral tone, based on the duties of the knight and of kings and princes. Such are the tales of King Arthur and the Round Table. These stories, which were Celtic in origin, spread to the continent. They were changed to fit local conditions, and repeated in France, Germany, Spain, and Italy. Other tales were modeled on them about the lives of Charlemagne and his followers. Toward the end of the Middle Ages, stories about common people began to be told. Some of these were told in songs, by wandering scholars, called *goliards*. Others were written in prose form. Boccaccio wrote his *Decameron* in the middle 1300's. The French *Heptameron* was modeled after Boccaccio. In England, Chaucer produced the *Canterbury Tales*, a combination of stories of chivalry, humor, religion, and realism.



John Wycliffe Translated the Bible from Latin into English during the 1300's and sent out preachers to read it to the people. This revival of learning had great and far-reaching effects on civilization, both politically and socially.

Religious writings continued to be important throughout this period. Stories of the lives of the saints were the most important of these works. Many religious works were written in Latin. Religious thought produced Dante's *Divine Comedy* (written 1302-1321), one of the greatest poems of all time. The *Divine Comedy* was an extremely important milestone in literature because it was the first serious work produced in a modern European language. Dante broke free from the tradition that declared that educated men must use Latin, and wrote in Italian.

The Renaissance (1400-1625). A new spirit began to rise in Europe in the 1400's. Men tired of the ties of tradition and authority which had bound them through the Middle Ages. They became curious about the world and about knowledge. Explorers discovered new lands. Scholars rediscovered the Greek and Roman classics which had lain dust-covered for hundreds of years. Translations of the classics were read eagerly by the common people.

The new awakening began in Italy. Many writers followed in the steps of Dante and Boccaccio. Petrarch established the sonnet, a form of poetry which became popular in all parts of Europe. In France, the new thirst for knowledge produced the essays of Montaigne and the rollicking tales of Rabelais. The Renaissance was late in reaching England. But when it did it created some of the greatest literature in the English language. Francis Bacon took "all knowledge" for his literary province. Marlowe and Shakespeare alone would have been enough to make a literary age. But besides them, there were Edmund Spenser, Sir Philip Sidney, Ben Jonson, Robert Greene, and others.

The Renaissance was a period of enthusiasm and change. Its literature exhibited a new spirit in new forms. In much of it we find a blending of medieval with newly rediscovered Greek and Roman forms and material. The plays of Marlowe and Shakespeare show this blending. Yet they are new, pure, and modern. The essays of Montaigne are completely personal, informal, and express a new spirit of free thought. Montaigne undermines tradition and asks questions he cannot answer. Yet he is so filled with cheerful warmth that he seems to be opening the door unaware, like Christopher Columbus, to a glorious new world.

Age of Reason (1625-1750). The Renaissance was an open-minded search for knowledge. It was also an age in which men enjoyed *things*—the goods which came from foreign countries and the pictures and poems produced by artists. But in the 1500's, especially in northern Europe, earnest and spiritually-minded men were outraged by the pagan and worldly attitude of the Renaissance. Even the Catholic Church, they thought, had been infected and corrupted by enthusiasm for material things. Led by Martin Luther, these outraged men ended by denying the authority of the Church. They claimed that each person should decide for himself how he could best lead a good and worth-while life. This revolt is called the Protestant Reformation. Through it the individualism and questioning characteristic of the Renaissance entered the field of religion. But even individualism has its limits. If everyone did just as he wished, there would be no government and no order to society. Thus the reformers were forced to seek a new authority to replace the authority of religious tradition. They turned to *reason*, or orderly thought. They be-

New Ideas Developed and Spread as literature was distributed more widely. Because most people were not able to read, many of those who could, became professional readers. Here Lorenzo de' Medici and his friends listen to such a reader.

lieved that all men everywhere would find the same answers through reasoning. Obedience to reason thus would hold all society together.

The Greek and Roman classics continued to be important during the Age of Reason. But they were looked at in a different light. During the Renaissance they were honored mainly because of their age and the authority that went with age. During the Age of Reason, Homer, Virgil, and Horace were honored on the ground that they had been accurate observers and had clearly expressed the truths about life. The new viewpoint was due to such men as Bacon, Hobbes, Locke, and Newton who flourished in England in the 1600's. These men showed the importance of logical thinking, and laid the foundations of modern science. Now the poet's aim was declared to be the same as that of the scientist—the discovery of general, or universal, truth. The scientist looked for abstract truth in the laws of nature. The poet's aim was to picture the truth as he saw it in living images.

The greatest English poet of the Puritans was John Milton. He did not really belong to the Age of Reason. In spirit, Milton was the majestic last voice of the Renaissance. Dryden, Pope, Addison, and Swift in England, and Voltaire in France, were more characteristic of the Age of Reason than Milton. In verse or prose they all satirically exposed the follies of mankind and urged a new social order based on reason.

Age of Romanticism (1750-1850). The men who found all their answers through reasoning thought little of emotions and natural instincts. They did not believe in just "feeling" that a thing was so. They did not trust emotions such as love, hate, and fear. They looked down upon anyone who had enthusiasm. Anything in the Gothic style was rejected because it stood for the Middle Ages, when human intelligence was asleep. This distrust of emotion showed up in literature, where imagination and free creation were bottled up. The Age of Reason taught men to think. But at the same time it caused literature to become cold and artificial and written in a formal style.

Romanticism is the name given to a many-sided revolt against this outcome of the Age of Reason. It arose in the German states and gathered force in France and England after 1750. It brought about a great renewal of literary creation throughout Europe, and had important echoes in America. The pendulum swings one way, then the other. Men are inclined to turn violently from one extreme to its opposite. Many romantic writers did just this. They praised man's natural feelings and instincts as sure guides to the wise conduct of life. And they dismissed reason and science, as false guides which could only lead men astray. "Enthusiasm" became a term of admiration. In the 1800's "Gothic" joined this new feeling, and everything that belonged to the Middle Ages began to seem excellent and worthy. Anything artificial was criticized. Simple life in the country, amid wild surroundings, was praised as the best life for man. The Romanticists admired natural scenery not only for its beauty, but because its beauty was a symbol of the divine soul of the universe. The simple, uncivilized life was believed to develop man's divine element, or soul. Uncivilized savages were looked upon as the noblest of human beings, and country folk were the next best. The worst people were supposed to be city people, who lived artificial lives.

At this point Romanticism joined hands with politics. Under the guidance of France's fiery Jean Jacques Rousseau, a new desire for democracy swept over the Western World. This desire was encouraged by the revolutions in France and America. The common man, who was being praised by Romanticists, became the noblest man. The Scottish peasant Robert Burns became the most popular man in Edinburgh, not so much for his poems about common people, but because he himself was a common man who had genius. He was almost as curious as Omai, a gentle and noble savage from the South Sea Islands who was being exhibited at parties in London. The new voice of "Nature" all but drowned out any common sense which literary and political people might have had.

Most poetry of the period expressed the new confidence in the unity, beauty, and goodness of the universe. This can be seen in the lyrics of Goethe, Lamartine, Wordsworth, Shelley, and Keats. In many of their poems they tended to ignore the ugly realities of life around them. They concentrated only on beauty. Other Romanticists, such as Chateaubriand and Byron, wrote of beauty but were conscious of the lack of it in actual life. Their works are full of melancholy and dissatisfaction with the real world compared to the world of their dreams.

It was to be expected in such an age that the drama would be neglected. Plays dealt largely with realities. Dreams and lyrical outbursts do not fit well into stage presentations. Such plays as were written, including Goethe's *Faust*, were not very successful on the stage. They made better reading than seeing.

The Romantics brought a renewed interest in the past. The Greek and Roman classics continued to be studied everywhere in school and college. Though many romantics were antirational, none was anticlassical. Indeed, appreciation of the achievements of Greek civilization widened and deepened in the Romantic period. And at the same time, as has been said, keen interest was awakened in the life, literature, and art of the Middle Ages. Writers also became interested in the traditional literature of country people and peasants. Old stories handed down by word of mouth by the common people were collected into books. Among these were the German fairy tales, collected by the Grimm brothers. The Waverley novels of Sir Walter Scott were translated and imitated all over Europe. In poetry, Alfred, Lord Tennyson, led among the lovers of the medieval.

The Romantics exaggerated the beauty and the goodness of life. People then began to realize the difference between things as they were and things as the poets dreamed about them. Dissatisfaction appeared, at first in mild form. Such writers as the novelist Charles Dickens began to complain about the troubles of poor and downtrodden people in all parts of England.

The Modern Period (1850-). It is much more difficult to describe literature of modern times than that of a period already in the past. But certain tendencies can be pointed out.

Modern literature has been greatly affected by the Industrial Revolution. New, fast means of transportation, an increase in education, and cheap printing costs have broken down literary barriers throughout the world. More people read than ever before. The works of each nation are read in other countries. Literary styles spread rapidly, are copied, and then die out. A style which might have lived fifty years in a former age now dies out in five years.

Truth and accuracy are the new watchwords. The movement which was a reaction against the overoptimism of the Romantics is called *Realism*. New scientific discoveries sped the growth of realism. Men hunted for new answers to moral and social problems.

The novel and the drama were the best means of expression for the realists. These forms have flowered in modern times. Among the great early novelists of the period were Émile Zola in France and Fyodor Dostoevsky and Leo Tolstoy in Russia. Realists such as Zola handled their human characters as though they were specimens to be studied in a scientific laboratory. Such playwrights as Henrik Ibsen in Norway and George Bernard Shaw in England used the same approach. Some writers have tried to express new thought by projecting themselves in their imagination into faraway worlds. They actually deal with the present world but they hide their thoughts in make-believe. This literary form, called *symbolism*, was made most popular by such playwrights as the Belgian Maurice Maeterlinck and the Italian Gabriele d'Annunzio. Other dramatists, such as Gerhart Hauptmann in Germany and Leonid Andreyev and Anton Chekhov in Russia, used both symbolism and realism.

Symbolism is less common among the novelists. Anatole France used a medieval setting for some of his stories, and Joseph Conrad wrote of the South Seas. But most novels of modern times use everyday life as their background. In the works of such writers as Thomas Hardy, John Galsworthy, and Thomas Mann, ordinary men have become just as acceptable characters for literature as the warrior, courtier, philosopher, lover, and adventurer. It is true that the first steps in this direction had been taken in the 1700's by Daniel Defoe, by Samuel Richardson in *Pamela*, and by Henry Fielding in *Joseph Andrews* and *Tom Jones*. Charles Dickens, too, had followed in the footsteps of Fielding and Tobias Smollett, and had succeeded in making many very ordinary persons interesting. Still, it is only in our own time, and with these novelists, that the common man has replaced the uncommon man as the central figure of modern literature.

Poetry is not so popular a form of literary expression as it once was. But poetry has been influenced by the same things that have influenced the novel and the drama. Dissatisfaction with old standards has produced many new forms and experiments with forms, including the unrhymed *free verse*. Poetry also has expressed the realism and the search for new truths of modern times. This can be seen in the works of such poets as Walt Whitman, T. S. Eliot, Carl Sandburg, and Amy Lowell. Modern poetry under these influences has changed much in form. It has also lost contact with large sections of the public. Few readers without long study can even guess what some present-day poets are trying to say.

Modern literature has produced one new form—the short story, which differs greatly from the older *tale* in compactness and strength of structure. The short story was developed by such masters as Guy de Maupassant in France and Edgar Allan Poe in America, and has made great progress since their time.

Modern literature is developing in several directions. No form or school can be said to be more popular than any other. There is much experimentation. Some of it has produced such unusual writings as the *stream-of-consciousness* works of Gertrude Stein and James Joyce. It has produced such bitter satires as the novels of Sinclair Lewis.

Other Literatures. Western readers have enjoyed the classic works of Greece and Rome for hundreds of years. But the literatures of most other cultures, especially those of Asia, have become known and appreciated in Europe and America only since the 1900's.

Chinese Literature to many people means the writings of Confucius, considered the author of many wise sayings that date back to the 500's B.C. Scholars have also translated works relating to Taoism, an ancient Chinese religion, including the *Tao Teh Ching*. Prose writers and poets familiar to Western readers include Li Po, Tu Fu, and Po Chü-i, all dating from the A.D. 700's. The *Chin-p'ing-mei*, a satiric novel of the 1500's, and *The Dream of the Red Chamber*, a tragic love story of the 1700's, have also become a part of Western literature. Contemporary Chinese writers popular in the West include the philosopher Lin Yutang and the critic Lusin, author of *True Story of Ah Q*.

Japanese Literature familiar to Western readers includes such famous works as *The Tale of Genji*, a novel of court life written by Lady Murasaki in the A.D. 1000's. Familiar Japanese drama includes the *Nō* plays, written mainly in the late 1300's, and the later *Joruri* and *Kabuki* dramas of the 1600's. The poet Basho first popularized the *haiku*, a short suggestive epigram, in the late 1600's.

Persian Literature dates back to old Iranian epics of the 500's B.C. These include the poems by Zoroaster called the *Gathas* and the *Avesta*, the sacred book of Zoroastrianism. Many scholars consider the quasi-historical Persian epic, the *Shah Namah*, or *Book of Kings*, written by the poet Firdausi in the A.D. 900's, as a famous piece of world literature. The *Rubáiyát* of Omar Khayyám, written in the 1100's, gained wide popularity in the translation by Edward FitzGerald. Other classics include the *Bostān*, or *Orchard*, a poetic discourse on ethics, and the *Gulistān*, or *Rose Garden*, a commentary on practical wisdom in prose and poetry, both by the famous lyric poet Saadi.

Indian Literature includes many ancient works written in Sanskrit, such as the famous sacred books, the *Rig-Veda* and the *Atharva-Veda* (see VEDA). Great epic poems of India include the *Mahabharata* and the *Ramayana*. The *Panchatantra*, or *Five Cases of Wisdom*, is a famous collection of Indian fables written between A.D. 200 and 600. It is the source of many later tales including the Fables of Bidpai. The modern Indian poet Rabindranath Tagore has many Western readers.

Arabic Literature consists mainly of scientific and philosophic knowledge translated from Greek, Persian, and Hebrew origins. Arabic literature also includes the *Koran*, the sacred Moslem book, and such famous tales as the *Arabian Nights*. Arabic poetry, including the *qasīda*, long intricate poem written in flowery language, influenced the style of Spanish and Italian tales of the Middle Ages.

ROBERT SHAFER

Related Articles. See the LITERATURE section of the READING AND STUDY GUIDE for a detailed list of references on literature. See the Arts section of the various state, province, and country articles, such as ALABAMA (The Arts). See also the following articles:

BIOGRAPHY

An alphabetical list of biographies relating to literature appears under the heading Authors in the BIOGRAPHY section of the READING AND STUDY GUIDE.

FORMS OF LITERATURE

Belles-Lettres
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LITERATURE OF THE WORLD

American Literature
Canadian Literature
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Sanskrit Language and Literature
Scandinavian Literature
Spanish Literature
Yiddish Language and Literature

UNCLASSIFIED

Book
Dictionary
Encyclopedia
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Library
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Quotation
Reading

Outline

I. Literature and Civilization
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III. History of Literature
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   D. Middle Ages (400-1400)
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   G. Age of Romanticism (1750-1850)
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Questions

Why are almost all the writings of early peoples considered as literature?

How has literature helped language to grow?

How has literature always been related to greatness of a nation?

Who are some authors who have brought about political changes through their writings?

In what ways can literature improve international relationships?

Into what classes is poetry commonly divided? Prose? What are some common forms of fiction?

How old is the first known example of written language? About how long ago was the first real literature produced?

For what two great poems is Homer famous?

How have the writings of Plato and Aristotle influenced modern thinking and writing?

How do you account for the fact that early Roman literature was much like the Greek?

Why was most of the literature of the Middle Ages concerned with religion?

LITERATURE FOR CHILDREN

Press Syndicate

LITERATURE FOR CHILDREN. Books written especially for children are a relatively new kind of literature. In fact, such literature is little more than 100 years old. Before about 1850, writers tried to teach and improve children. The only books for children taught lessons on how to behave and what to believe. They also contained lessons on the ideas of history and science at that time.

Children found these books dull and tiresome, and turned instead to stories that their parents and older friends enjoyed. Many children still read and love books that were written primarily for adults, such as Daniel Defoe's *Robinson Crusoe*, Jonathan Swift's *Gulliver's Travels*, and Washington Irving's *Rip Van Winkle*.

Children today can choose from thousands of books written and illustrated especially for them. Good books make it possible to live more lives than one. By opening a book or going to a story hour at a library, children can share the experience of a boy clinging to the back of a goose flying high over Sweden, a tomboy growing up in Hungary, or a man cast away on a desert island. Through good literature, children can find new friends, laughter, knowledge, and an understanding of people of all ages in all parts of the world.

The History of Children's Literature

Even as far back as the A.D. 600's, in the Old English or Anglo-Saxon period, monks and other learned men wrote "lesson books" for children. These men wrote in a form of English which children today could not read. It requires long months of study to be able to read this Old English or Anglo-Saxon language.

The Early Beginnings. Aldhelm (640?-709), the abbot of Malmesbury and bishop of Sherborne, was probably the first man to write lesson books for children. His *De Septenario, de Metris, Enigmatibus, ac-Pedum Regulis* contained a long essay on the meaning and use of the number seven in the Bible. The title of his book is translated in this way: "Concerning the number seven, meter, enigmas (riddles, puzzles), and the rules of feet." Some of the ideas were probably Aldhelm's own, but he took the riddles from older manuscripts. Aldhelm discussed the meaning of the number seven as it was used in the Bible. The *meter*, or feet, referred to Latin verse forms. The riddles and puzzles which the pupils were asked to solve were written in Latin.

Aldhelm set the pattern of children's writing. Until about 1500, all books of instruction used the question and answer form or were written in verse.

The Venerable Bede (673-735) was another early writer. For fifty-two years he was a teacher at the monastery school of Jarrow, in Durham County in England. He was an outstanding author of lesson books. Bede showed more imagination than Aldhelm and was more creative. His *De Natura Rerum* was a book that contained all the knowledge then known of natural science, natural history, and the study of plants and flowers and the stars. Bede was widely read. He could write for his pupils in clear, plain, understandable Latin. This textbook was cut down and translated into Anglo-Saxon in the A.D. 900's. It was a small spark of intellectual light during the Dark Ages when men made little progress in learning.

The next great teacher was Egbert of York (?-766?). He collected the works of monks like Aldhelm and Bede. In his library were also the works of Orosius, who was an authority on history, and books by the outstanding Greek and Roman authors. Learning now began to widen a little. Egbert founded the famous school at York. There, Alcuin (735-804) studied. He wrote a wide variety of lesson books, still using the question and answer, or *dialogue*, form. Many of his books were on grammar. He went farther than authors who came before him. Alcuin was tutor to the king's sons and to several girls of the household at the court of Charlemagne (742-814), in Aachen. This is one of the earliest records of coeducation, or educating boys and girls together. It is even more remarkable because, at that time, girls were seldom taught to read.

Alfred the Great (849-899) was a great hero of England. He drove back the invasions of the Danes. Later, he proved himself equally great in the ways of peace. Alfred translated Latin literature into Anglo-Saxon, with the help of a number of scholars. Children in the schools in monasteries had to read and speak Latin in and out of school until about 1350. But Alfred had the best of the literature of his time translated from Latin into Old English, and made it understandable to the common man.

Aelfric (955?-1020?) was a teacher in the monastic school in Winchester. He was the leading educator of the A.D. 900's, and was called *Grammaticus*. He wrote his *Colloquy* also in the question and answer form, and used subjects from everyday life. The *Colloquy* is a dialogue between the pupil and the teacher, with the pupil "begging to be taught," and the teacher answering questions on occupations and trades. The book gives much information on manners and customs of the times. Details of what people ate and how they lived every day are sometimes amusing and always interesting. The "ponies," or language translations, which students of Latin sometimes use today, originated nearly 1,000 years ago. The *Colloquy* of Aelfric was written in Latin, but between the lines there was a translation into Anglo-Saxon. This is one of the last notable writings in Anglo-Saxon, which is sometimes called Old English.

Another highlight of this period was the first encyclopedia for children. It was written by Anselm (1033-1109), the archbishop of Canterbury, and called *Elucidarium*.

The Middle English Period. William the Conqueror and his Norman French knights won England in 1066, and French became the language of the nobility. Many French words were taken into English at this time. This period was called the Middle English Period. It lasted until the invention of the printing press and the coming of the Renaissance around 1450. The children of the nobility received instruction in manners and morals during this period. Some treatises were addressed to servants. One of the best known was *The Babees Boke, or, A lytle Reporte of how Young People should behave*. There is an introduction of fifty-six lines to this book. Then "the whole duty of children" is set forth in one hundred and sixty lines. Another rhymed one was *The Boke of Curtesye*, which was well known before the beginning of printing. The 848 lines of this book are divided into three parts. The first tells how children should act. It describes the correct behavior of a guest who is dining at the home of a nobleman. It gives rules of proper table manners. The second part gives moral instruction. The third explains in detail the duties of all the servants in a nobleman's household.

Much like this book is William Caxton's *Book of Curteseye*, which was printed by Caxton (1421-1491), the first English printer. It dates from about 1477, and contains rules of behavior much like those found in earlier books. It also suggests books which are suitable for young persons to read. Boys of noble families often received training in the households of other nobles, and such books helped them know how to act. There were also at least two books in manuscript form especially for girls. These were *How the Good Wife Taught Her Daughter* (about 1430) and *The Booke of the Enseynements and Teachynge that the Knight of the Toure made to his Daughter*. This second one was translated from the French and printed by William Caxton. Another translation which Caxton made from the French was the *Myrrore of the Worlde*, much like Anselm's *Elucidarium*. This was published in 1481.

Still another encyclopedia was *The Wyse Chyld of Thre Yere Old*. This was first printed in Cologne in 1470. It was translated into English from the original Latin and printed in 1495 by Wynkyn de Worde, who followed Caxton. Caxton also printed Sir Thomas Malory's *Noble Historyes of King Arthur*, *Aesop's Fables*, *The History of Reynard the Fox*, *Guy of Warwick*, and *The Seven Champions of Christendom*. He printed many other moral and *didactic*, or teaching, works to educate and instruct his readers.

The Renaissance. Printed books were much too expensive to be generally used by children in early days. Instead, the hornbook was made for them about 1550. The hornbook was not really a book. It was a printed page pasted on a square piece of wood that had a handle at one end. The page was protected by a transparent piece of horn, somewhat like clear plastic. It was often bound by a metal rim. A cord could be put through a hole in the handle and fastened to a child's belt or girdle. The text always started with the crisscross, or christcross. This was followed by the alphabet, first in small letters and then in capital letters. Groups of syllables were below this. They were followed by the words, "In the Name of the Father and of the Son and of the Holy Ghost, Amen." Then came the Lord's Prayer. See HORNBOOK.

After the hornbook, rhymed alphabets and primers were published for children. Among these was the fore-

A Little Girl Asks a Blessing on Her Food Before Eating.

An Elizabeth Orton Jones Illustration for *Prayer for a Child* by Rachel Field. By permission of The Macmillan Co., publishers

From *R. Caldecott's Picture Book*, published by Frederick Warne & Co.

The Three Jovial Huntsmen

runner of the *New England Primer*, which was first published by Harris in Boston in 1691. It was called the *Royal Primer*. Here each letter of the alphabet was the key letter of a still familiar verse, such as:

A—In Adam's fall
We sinned all

running down to:

Z—Zaccheus he
Did climb a tree
His Lord to see.

The *Royal Primer* was popular. Probably more than a million copies were sold during the hundred years that it was used as a textbook for younger children.

Puritan Times. In the 1600's, children's books in England and America were rather gloomy. They reflected the Puritan outlook. The Puritans were much more interested in the fear of God than they were in the love of life. Thomas Janeway's *The Token for Children, Being an Exact Account of the Conversion, Holy and Exemplary Lives and Joyful Deaths of Several Young Children*, is typical of this time. These lines show how Janeway felt:

When by spectators I am told
What beauty doth adorn me,
Or in a glass when I behold
How sweetly God did form me,
Hath God such comeliness bestowed
And on me made to dwell,
What pity such a pretty maid
As I should go to Hell!

English parents also recommended John Foxe's (1516-1587) *Book of Martyrs* and John Bunyan's (1628-1688) *Divine Emblems*.

In America, the books for children were either reprints of English publications, or local writings that were even drearier. Some of their titles sound very sad indeed: *Young People Warned, the Voice of God in the Late Terrible Throat Distemper;* and *A Dying Father's Legacy to an Only Child.* Cotton Mather (1663-1728) wrote a *Token for Children of New England, examples of children in whom the fear of God was remarkably budding before they died.*

The one really outstanding book of this Puritan period of gloom was John Bunyan's *Pilgrim's Progress.* It has lived because it has universal truth in it. *Pilgrim's Progress* is an allegory on the development of the human soul. In this story, the characters themselves represent various qualities, such as despair, gloom, perseverance, and hope. Children still read this book as a good adventure story. *Pilgrim's Progress* is one of those books which never grow old and which mean different things to a person as he lives on through life.

Two other books which were written for older people in the late 1600's and early 1700's have become children's classics. They are Daniel Defoe's (1660-1731) *Robinson Crusoe* and Jonathan Swift's (1667-1745) *Gulliver's Travels.* Like *Pilgrim's Progress*, the story of Robinson Crusoe was also an allegory in which there were deeper meanings, but it is now enjoyed as an adventure story. *Gulliver's Travels* was written as a political satire. But children love it as humor, especially the first book, telling of Gulliver's travels to the land of the Lilliputians, or the little people.

The first picture book for children is said to be *Orbis Pictus* (*The World in Pictures*). It was written in 1637 by

A Kate Greenaway Illustration

From *Little Ann* by Jane and Ann Taylor, published by Frederick Warne & Co.

THE GOOD-NATURED GIRLS.

Two good little children, named Mary and Ann,
Both happily live, as good girls always can;
And though they are not either sullen or mute,
They seldom or never are heard to dispute.

A Walter Crane illustration for *The Baby's Opera*, published by Frederick Warne & Co.

Jack and Jill Coming Down the Hill

John Amos Comenius (1592-1670). He wrote it in Latin and German. The book was translated into English by Charles Hoole in 1658. Comenius was a bishop of Moravia, and an educator who believed in teaching children by means of letting them see things with their own eyes. He also believed in the conversational method of teaching languages, and in teaching the language of the people instead of Latin. Comenius thought that men and women should receive the same education. He wanted to unite all nations through a common system of education. It is believed that Comenius was asked to come to the United States to be president of Harvard College in 1641. But he never came.

The 1700's. At last someone appeared on the scene who recognized that children had special interests, and who tried to meet them. This man was John Newbery (1713-1767), a writer, publisher, and bookseller of Saint Paul's Churchyard, London. He published a series of books for children. The first of them was the *Little Pretty Pocketbook* in 1744. A copy of this book was printed in the United States in 1944, on the two hundredth anniversary of its first appearance. Newbery also printed *chapbooks*. These were cheap little paper editions which were sold on the streets by peddlers, or chapmen. They contained ballads and folk tales. The ordinary person could afford to buy these books. Samuel Johnson and Oliver Goldsmith were friends of John Newbery. Probably they both wrote some of these chapbooks. The style of *The History of Little Goody Two-Shoes* (1765) shows humor like Goldsmith's, but the authorship has never been proved. This book is known as the first book of fiction written solely to entertain children, and was printed 100 years before Lewis Carroll's *Alice's Adventures in Wonderland*.

Like Caxton, Newbery published translations from the French. Among these was *Tales of Mother Goose* by Charles Perrault (1628-1703), a member of the French Academy. In Perrault's time, it was beneath the dignity of authors to write books for children. As a result, books by Perrault were published without any name attached to them. It is generally believed now that either Perrault or his son wrote *Blue Beard*, *The Three Witches*, *The Sleeping Beauty*, *Puss in Boots*, and *Red Riding Hood*. In the Tuileries gardens in Paris there is a statue of Perrault. It shows him seated, with figures of gay little children dancing around him. Newbery also published a collection of Mother Goose nursery rhymes. The first American edition of *Mother Goose's Melodies* appeared in 1785, eighteen years after Newbery died. See MOTHER GOOSE.

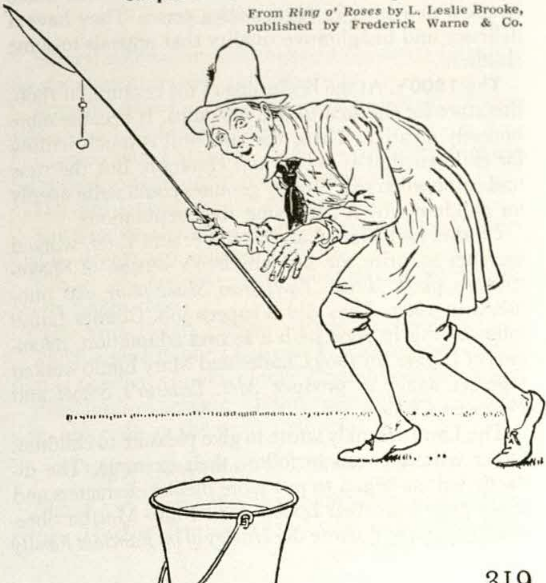
Two years after John Newbery died, one of his helpers, Benjamin Collins, originated the *battledore*. This was a folding three-leaved cardboard. On it were numerals, easy reading lessons, alphabets, and little woodcuts. Unlike the hornbook, it contained no religious instruction. The battledore was entertaining, instructive, and cheap. It was popular until about 1850.

In France, at about the same time, Jean Jacques Rousseau (1712-1778) was startling his country and the world with a new theory of education. He described it in his book, *Émile*. Rousseau wanted to see men grow up naturally. Misunderstanding of his theory set in motion the didactic, or teaching, school of writing. Prissy, smug, good little boys were always successful in these stories. Bad little boys always came to a bad end.

An immediate follower of Rousseau's *Émile* was Thomas Day's (1748-1789) *Sanford and Merton* in 1783. It was a story about a good little boy named Harry Sanford and his tutor, Mr. Barlow. These two tried to reform bad little Tommy Merton, but had very little success. Three other writers of this time influenced children's literature. Mrs. Anna Letitia Barbauld (1743-1825) worked with her brother, Dr. Aikin, to write *Evenings at Home*. This book combined real science with unreal science. Mrs. Sarah Kirby Trimmer (1741-1810) wrote Sunday-school stories. Her *History of the Robins* (1786) was the first children's story to have a theme of "kindness to dumb creatures." Maria Edgeworth (1767-1849) was

Simple Simon Went A-Fishing.

From *Ring o' Roses* by L. Leslie Brooke, published by Frederick Warne & Co.



From *Call It Courage* by Armstrong Sperry, by permission of The Macmillan Co., publishers

Mafatu, Though a South Sea Island Boy, Fears the Sea.

a really skillful writer. She had a true understanding of children, but her work was still rather didactic and moralizing. Even so, many of the tales in *Parent's Assistant* (1796) and *Moral Tales* (1801) are delightful. They are still read today, a fact which proves their lasting quality and truth.

William Blake (1757-1827) published his *Songs of Innocence* in 1789 and *Songs of Experience* in 1794. These are songs *about* children rather than *for* children. Blake struck a new note in his sensitive verses. They have a delicacy and imaginative quality that appeals to some children.

The 1800's. At the beginning of the century, in 1800, literature for children took a new turn. It became more honestly creative. There was and still is much writing for children that is cheap and common. But the time had come when real literary geniuses could write openly for children without harming their reputations.

Charles and Mary Lamb, brother and sister, worked together to write the first children's version of Shakespeare's plays. Their *Tales from Shakespeare* was published in 1807. They did a superb job. Charles Lamb followed this in 1808 with a second adaptation, *Adventures of Ulysses*. In 1809 Charles and Mary Lamb worked together again to produce *Mrs. Leicester's School* and *Poetry for Children*.

The Lambs frankly wrote to give pleasure to children. Other writers began to follow their example. The didactic writers began to put more lifelike characters and fewer prigs into their books. Mrs. Mary Martha Sherwood (1755-1851) wrote the *History of the Fairchild Family* in 1818. There were long religious discussions in this book, but the children were much more natural.

Jane Taylor (1783-1824) and her sister Ann (1782-1866) were didactics with a smile. Together they published *Little Ann and Other Poems* in 1804. A new edition of *Little Ann* was published in 1883. It had charming illustrations by Kate Greenaway (1846-1901). In 1904 an anniversary edition called *Original Poems and Others* was edited by E. V. Lucas and delightfully illustrated by Francis D. Bedford. Children today still enjoy these stories in spite of their moralizing tone. Each new generation still enjoys Jane Taylor's famous little poem, "Twinkle, Twinkle, Little Star."

Period of Change. During the next 50 years, great authors wrote many books that are still enjoyed. These books had a powerful influence on the writing for children that followed. Many of these authors are common household names today. The Grimm brothers, Jacob Ludwig and Wilhelm Carl, traveled around Germany, talking to the people and collecting their folk stories. *Popular Stories* was translated into English in 1824 (see GRIMM'S FAIRY TALES). Because of their work, most later collectors of fairy tales followed the stories as the people told them, instead of changing them. In 1841, Hans Christian Andersen's great fairy tales were translated into English. These works are called *modern* fairy tales, because Andersen actually wrote them. He copied old ways of telling stories.

About this same time, other authors began to write children's stories that contained good characterizations and accurate description. Harriet Martineau's (1802-1876) *Feats of the Fjord* was published in 1841. Her *Crofton Boys* (1841) was one of the earliest school stories. This was followed in 1857 by *Tom Brown's School Days* by Thomas Hughes (1822-1896). Charlotte Mary Yonge (1823-1901) wrote a number of interesting historical stories, such as *Dove in the Eagle's Nest* in 1866 and *Little Duke* in 1854. In this same general period James Fenimore Cooper was writing the *Leatherstocking Tales*.

Another American who wrote at this time was Washington Irving (1783-1859). His *Legend of Sleepy Hollow* (1819) and *Rip Van Winkle* (1819) are imaginary tales about the Hudson River Valley. They are still so popular that attractive new editions are published from time to time. His *Knickerbocker's History of New York* (1828) was edited in 1928 by Anne Carroll Moore and illus-

From Robert Lawson's *Rabbit Hill*, published by Viking Press, Inc.

Georgie Thinks about the Big Garden the "New Folks" at the "Big House" will plant, and plans the fun he will have.

trated by James Daugherty. The result was a book which was much more attractive and less wordy than the original edition. The *Tales from the Alhambra* (1832) has also been edited and published in recent editions.

The *Peter Parley* books by Samuel Goodrich (1793-1860) were a long series of informational works. They were much copied by other writers. Then came the Abbotts, Jacob (1803-1879) and his brother John Stevens (1805-1877). Jacob Abbott wrote the *Rollo Books* and *Franconia Stories*, as well as a long series of biographies and travel books. Some of these he wrote with his brother. In 1923 *Franconia Stories* was published in attractive format. It is a pleasant children's book that tells of the daily life in New England in the middle 1800's.

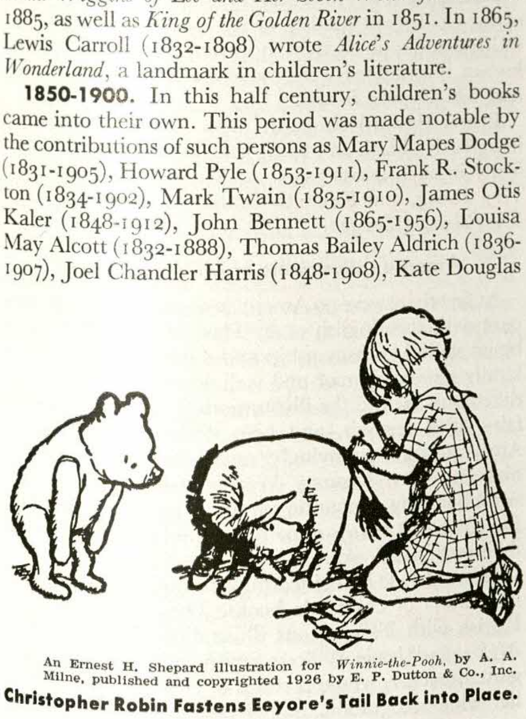
Charles Kingsley and Nathaniel Hawthorne both retold the Greek myths in simple prose. Kingsley's *Heroes* in 1856 and Hawthorne's *Wonder Book* and *Tanglewood Tales* in 1851 are still read by children.

Fun for its own sake began to appear in children's literature about this time. *The Butterfly's Ball* by William Roscoe (1753-1831) was published in large type and illustrated with gay, colored pictures. In 1846 Edward Lear published his *Book of Nonsense*. The type of poem called the limerick was here to stay. Two years later, in 1848, Heinrich Hoffmann-Donner's *Struwwelpeter* was translated into English. It was followed some years later, in 1901, by *Clean Peter, or the Children of Grubbylea* by Ottilia Adelborg (1855-1936).

Many well-known writers of books for older people continued to write fine books for children. Sir Walter Scott (1771-1832) wrote *Tales of a Grandfather* between 1828 and 1830. *The Rose and the Ring*, by William Makepeace Thackeray (1811-1863), appeared in 1854. Charles Dickens (1812-1870) wrote *Child's History of England* in 1854 and 1855, *A Christmas Carol* in 1843, and *The Magic Fishbone* in 1868. John Ruskin (1819-1900) wrote *Dame Wiggins of Lee and Her Seven Wonderful Cats* in 1885, as well as *King of the Golden River* in 1851. In 1865, Lewis Carroll (1832-1898) wrote *Alice's Adventures in Wonderland*, a landmark in children's literature.

1850-1900. In this half century, children's books came into their own. This period was made notable by the contributions of such persons as Mary Mapes Dodge (1831-1905), Howard Pyle (1853-1911), Frank R. Stockton (1834-1902), Mark Twain (1835-1910), James Otis Kaler (1848-1912), John Bennett (1865-1956), Louisa May Alcott (1832-1888), Thomas Bailey Aldrich (1836-1907), Joel Chandler Harris (1848-1908), Kate Douglas Wiggin (1856-1923), Laura E. Richards (1850-1943), Gelett Burgess (1866-1951), Frances Hodgson Burnett (1849-1924), and Palmer Cox (1840-1924).

English authors of the same period include George Macdonald (1824-1905), Christina Rossetti (1830-1894), Robert Louis Stevenson (1850-1894), Rudyard Kipling (1865-1936), Sir James M. Barrie (1860-1937), Walter De La Mare (1873-1956), William H. Hudson (1841-1922), and Kenneth Grahame (1859-1932).



An Ernest H. Shepard illustration for *Winnie-the-Pooh*, by A. A. Milne, published and copyrighted 1926 by E. P. Dutton & Co., Inc.

Christopher Robin Fastens Eeyore's Tail Back into Place.

From *The Merry Adventures of Robin Hood*, by Howard Pyle, published by Charles Scribner's Sons

Robin Hood and His Men Are Heroes of Many Legends.

Special Collections

Several noteworthy collections of children's literature for the student include the following:

Boys and Girls House, Toronto—The Osborne collection of early children's books.

Connecticut Historical Society—Children's books published in the United States before 1836.

Harvard University—Chapbooks.

Huntington Library and Art Gallery, San Marino, Calif.—Illustrated children's books.

Library of Congress—Books published in the United States before 1900.

New York Public Library—Early children's books.

Philadelphia Public Library—The Rosenbach collection of children's books, chiefly English and American.

Pittsburgh, Carnegie Library of—Historical collection, especially of the years 1750-1800.

English Illustrators of Children's Books

About 150 years after the publication of the *Orbis Pictus*, Thomas Bewick (1753-1828) and his younger

From *The Tall Book of Nursery Tales*, illustrated by Feodor Rojankovsky, and published by Harper & Bros.

"The Foolish Milkmaid" Is an Old Folk Tale for Children.

brother, John, began to take a serious interest in illustrating children's books. Thomas Bewick was a wood etcher and engraver. A wood engraving is cut on the end of the grain of the wood and a woodcut is cut on the flat of the wood. The engravings are usually considered finer, since they permit more detail in the picture. John Newbery used illustrations by both the Bewick brothers. Their work was usually humorous and occasionally satirical.

George Cruikshank (1792-1878) was the immortal illustrator of Dickens' books. Cruikshank still delights children with his gay, rollicking illustrations for *Grimm's Fairy Tales*. He set a standard of form and fun in illustration that has lasted to the present day.

Richard Doyle (1824-1883) drew the cover for the magazine *Punch*. He is still remembered for his illustrations for Ruskin's *King of the Golden River*. He was less satirical than George Cruikshank, and did not produce as many illustrations.

A third illustrator was Sir John Tenniel (1820-1914). His illustrations for Lewis Carroll's *Alice's Adventures in Wonderland* were exactly right to suit the mood of that ageless story. Many other artists have drawn pictures for this children's classic, but their work lacks flavor when it is compared with that of Tenniel.

A little while later there was another trio of artists who left their mark on children's books. These were Walter Crane (1845-1915), Randolph Caldecott (1846-1886), and Kate Greenaway (1846-1901). All these artists appealed to children. They used quite different techniques in their illustrations. Crane's work was very decorative. He used bold color against a black outline and included much detail. Caldecott, however, used very little detail. He achieved his effect with the fewest possible strokes and was very subtle in his use of color. He was a master at painting rosy-cheeked country folk full of the joy of living. Kate Greenaway is best known for her pictures of children. In their quaint costumes, her children are neat, dainty, and as colorful as the flowers which almost always decorate Greenaway illustrations.

The first illustrations of *Little Lord Fauntleroy* were done by Reginald Bathurst Birch. He was born in England in 1856, but spent much of his life in the United States before his death in 1942. Frances Hodgson Burnett's *Little Lord Fauntleroy* (1886), with his curls and lace collars, set a style which sentimental mothers used for many years in dressing their little boys.

There were many excellent English illustrators around 1900. L. Leslie Brooke (1862-1940) had a style very much like that of Caldecott. He used subtle color and few lines. Brooke's many pictures of animals will delight children for years to come. Francis D. Bedford (1864-) makes delicate and fanciful illustrations. These were especially good for Barrie's *Peter and Wendy*, as well as for several of Dickens' children's books, and those of George and Greville Macdonald.

Arthur Rackham (1867-1939) did illustrations with ivory tints and a strange mysterious quality. They appear at their best in books of fairy tales, such as Barrie's *Peter Pan in Kensington Garden* and La Motte-Fouqué's *Undine*.

Edmund Dulac (1882-1953) had great charm because of the opalescent quality of his work. It is somewhat stylized and sophisticated, however. Some of his better-known illustrations were made for the *Arabian Nights* and *The Sleeping Beauty*.

Ernest Howard Shepard (1879-) did lively and imaginative black and white drawings which fitted perfectly in such books as A. A. Milne's *When We Were Very Young*, and Kenneth Grahame's *Golden Age* and *The Reluctant Dragon*.

American Illustrators of Children's Books

At first there were no American artists who could compare with the English ones. Then Howard Pyle combined skillful craftsmanship and a sense of color with a kindly sense of humor and well-developed sense of the ridiculous. He did the illustrations for his own books of fairy tales, legends, and hero stories. He interpreted American history movingly, especially that of the Colonial and Revolutionary War periods. And he drew swashbuckling, romantic pirates, armed to the teeth. But there was always something about them that belied their terrifying looks.

Howard Pyle had gifted pupils who became noted as illustrators of children's books. There were Maxfield Parrish with his gorgeous illustrations of the *Arabian Nights*, and Jessie Willcox Smith, originally a kindergarten teacher, whose pictures of children have earned her wide recognition. She is especially noted for her illustrations of *Mother Goose* and Stevenson's *A Child's Garden of Verses*. N. C. Wyeth, like Pyle, had a special talent for illustrating historical tales and tales of pirates. He did the pictures for Stevenson's *Treasure Island* and *The Black Arrow*.

There are many American women illustrators. Dorothy P. Lathrop does work that always has a delicate, elfin quality suggesting the unseen, although picturing the visible world. In a sense, such a statement is also true of Elizabeth Orton Jones. Wanda Gág's *Millions of Cats* with its folklore quality and genuinely amusing pictures will be long beloved. Helen Sewell's illustrations are gay and appealing.

Virginia Lee Burton wrote and illustrated charming picture books in which she gave human qualities to man-made objects such as steam shovels. Barbara Cooney caught the spirit of the books she illustrated for the popular Margaret Wise Brown. Marguerite De Angeli is the author-illustrator of several stories with an historical setting. She has been particularly successful with stories about the Pennsylvania Dutch people. Marie Hall Ets has written and illustrated simple tales that are both gay and wise. And Marcia Brown has done admirable illustrations for folk tales which she has adapted, many of them from the French. Claire Turlay Newberry's pictures of kittens are so realistic that children often touch them, to see if they are as cuddly and furry as they look.

Another author-artist of high skill is Kate Seredy. Her *The White Stag* is an outstanding book. It tells the story of Attila the Hun in prose that is almost Biblical in its simplicity and rhythm. Bold black and white illustrations vividly portray the sweeping conquest of the invaders.

Several husbands and wives are writing and illustrating together. Berta and Elmer Hader have been particularly successful with picture books of simple text. They have done books that present American geography and history in terms that little children can understand. Maud and Miska Petersham began with *Miki*, a classic of Hungarian life that Miska knew well. Edgar and Ingri d'Aulaire first gained notice with their *Magic Carpet*. They have since done fine books with Scandinavian and historical backgrounds, written clearly and interestingly.

Many artists who have lived at one time or another in Europe have brought an unusual flavor into their illustrations made in America. Boris Artzybasheff, who was born in the Ukraine, has retold and illustrated the Russian classic *The Golden Cockerel*. All his work has a distinctive decorative quality. It is at the same time sophisticated and beautiful. Elsa Beskow, the wife of a Swedish minister, has written and illustrated several books of child life in Sweden that have a wide appeal. Kay Nielsen, from Denmark, has done illustrations for *East o' the Sun and West o' the Moon*. The ideas in his drawings resemble those of Artzybasheff. His color is at times like that of Edmund Dulac, the French artist whose most successful work was that which required lightness, grace, and gaiety, as expressed in his illustrations for *The Sleeping Beauty*.

Willy Pogány was born in Hungary. His illustrations are usually in black and white. With both Pogány and Artzybasheff, the line is the thing. Pogány has been successful in many fields, including those of murals and stage design. But he is best known by children as the illustrator of Padraic Colum's books of myth and legend. The collaboration of Colum and Pogány ranks with that of Carroll and Tenniel, Milne and Shepard.

Kurt Wiese, a native of Germany, has traveled in all parts of the world. He went to Europe, Asia, Australia, Africa, and Brazil, before coming to New York City. With his unusual knowledge of people and his understanding of boys, he has done fine illustrations for many types of books.

Another happy combination of author and illustrator is Munro Leaf and Robert Lawson. Their first book, *Ferdinand, the Story of a Bull*, skyrocketed them into fame. Lawson became an author in his own right when he won the 1945 Newbery Medal for his *Rabbit Hill*. The Caldecott Medal was awarded to him in 1941 for his illustrations for *They Were Strong and Good*. Lawson was the first person to receive both medals. There is a kind of "folksy" quality to his pictures, as well as a strong trace of Howard Pyle at his whimsical best, and a delight in the small weaknesses of all living things.

Robert McCloskey is an artist who remembers accurately and sees clearly. His first book, *Lentil*, won high praise, especially from those who knew and loved small towns in the Middle West. His second book, *Make Way for Ducklings*, won him the Caldecott Medal.

James H. Daugherty's rugged style is well adapted to his stories of pioneer days in America. Leo Politi has contributed much to our understanding of the Spanish-American life in Southern California. The Italian people of New York City and San Francisco have become friends through the stories and illustrations of Valenti Angelo. Jean Charlot and René d'Harnoncourt have given true pictures of children and customs in Mexico. For sheer fun, Dr. Seuss is a prime favorite with books like *And to Think That I Saw It on Mulberry Street*. In modern vein, Nicolas Mordvinoff uses line drawings to express action and fun. Roger Duvoisin's illustrations are striking in design and color. William Pène du Bois makes lively and colorful pictures that are enjoyed by the very young and also by older children.

What Makes a Good Children's Book?

With more than a thousand new books for children being published each year, not even the largest public libraries can buy them all. It is therefore important to be able to decide whether or not they are good. In order to judge truly of their worth, these questions may serve as a guide:

Who is the author? What else has he written? What are his qualifications?

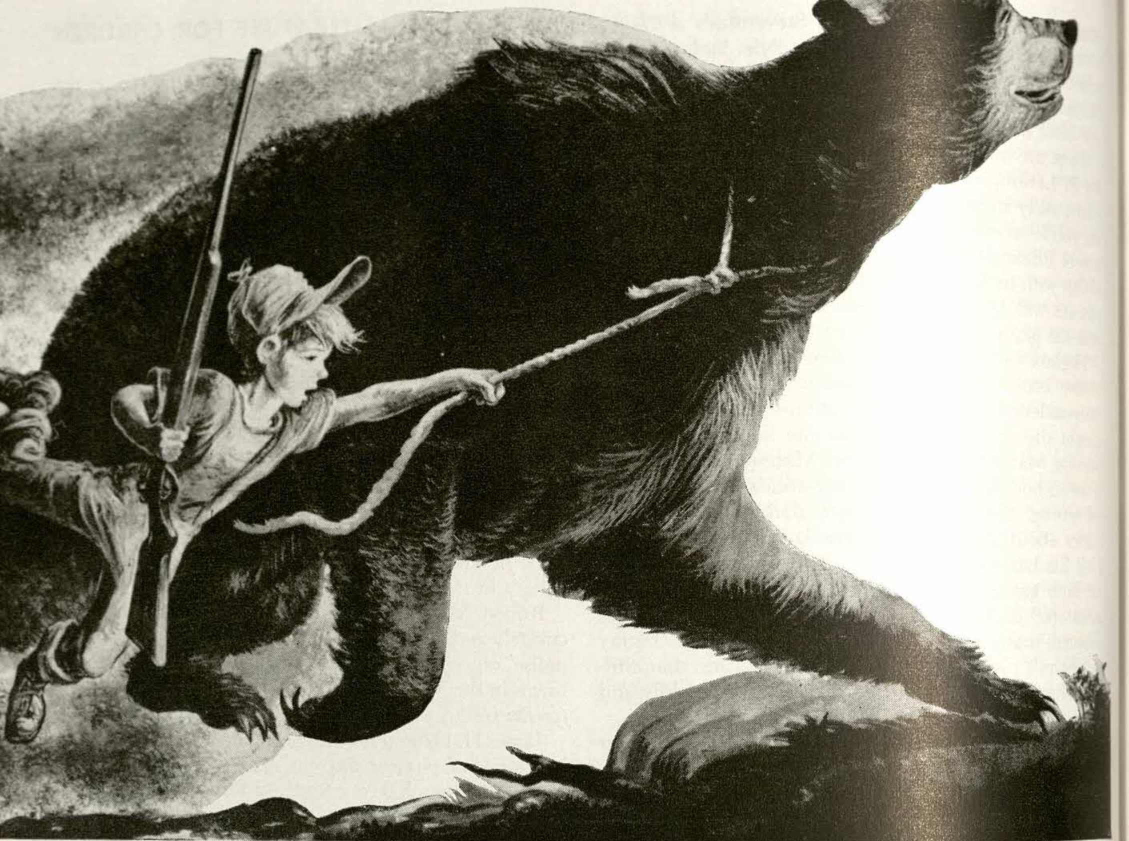
What is the purpose of the book? Inspirational? Informational? Practical? How well does the book fulfill this purpose?

What is the subject of the book? Is it within a child's comprehension? Is it true to life? How does it compare with other books on the same subject? Do children like it?

Do the characters seem real? Do events arise naturally out of character qualities, or do they seem forced?

Who publishes the book? Is it a reliable publishing firm?

Is the style of writing distinctive? Commonplace?



From *The Biggest Bear* by Lynd Ward. © Houghton Mifflin Company

Johnny's Baby Bear Grows to Be the Biggest Bear and a Real Problem.

Grammatical? Involved? Oversimplified?

Is the format suitable in cover? Binding? Size? Type? Spacing? Margins?

Are the illustrations suitable in line? Color? Imagination? Do they supplement the text?

If the book is other than fiction or poetry, is there an index? A bibliography?

Has it lasting value because of content? Style? Format?

Different persons will answer these questions in different ways. If the individual knows the standards of selection, and if he is honest with himself in applying those standards, then his selection is the right book for him *at that time.*

Children's Librarians

In the late 1800's, public libraries began to realize that it is important to have a separate room for the use of children. Early in the 1900's, the Carnegie Library School of Pittsburgh gave the first course of training for children's librarians. Its value was at once recognized. Other library schools followed the example. The graduates were a small group at first. But they had the advantage of knowing the history of the development of literature for children. They had well-defined standards for judging books. They were trained storytellers. They also had a background of sociology and were able to work with sympathy and understanding with the many groups in their various communities. They had lived with children and worked with them, and could understand the problems of young boys and girls. These first children's librarians soon became an important influence in the field of children's literature.

These pioneers were helping, advising, guiding, stimulating, and entertaining young people several years before the movies, before the radio, before television, and before there were any national organizations of young people. They set a standard which has proved good.

From Pittsburgh, the idea of training children's librarians spread across the country. The training is not given in all library schools, but it is available on the Atlantic Coast and the Pacific Coast, on the Gulf of Mexico, and in the Middle West and Rocky Mountain areas.

Today there are hundreds of library-school graduates working in school libraries and in children's rooms of public libraries. Like the early Pittsburgh graduates, they work closely with teachers in supplying supplementary materials for classroom use. They tell stories and they read aloud—often in intimate, informal groups. They are interested in children as individuals, and provide the means whereby the children discover that it is fun to read. Outstanding work has been done with discussion groups, and with boys and girls who have special hobbies. Children's librarians have provided an important stimulus to learning.

Young People's Librarians

Public library service for young people has grown rapidly in recent years. The idea of providing this special service for teen-age readers is only about 30 years old. But many librarians now recognize that young people have a great need for special service. These readers often consider themselves too old for the children's department of the library. But they may not feel at home in the adult department. Young people's librarians help them to bridge the gap.

Trained young people's librarians guide their readers in choosing books that will satisfy their present interests and stimulate new interests. The young people's section may also provide general reference service. The librarians organize group activities to encourage more and better reading. One of their most important functions is to provide educational and vocational guidance information for their readers. They cooperate closely with schools and other local organizations.

Children's Editors

Early in the 1900's, some publishers began to issue beautifully illustrated editions of children's classics. Many of the artists engaged for this work had been pupils of Howard Pyle. Then in 1919 one publisher took a long step forward. He announced the establishment of a new department to be devoted entirely to the production of books for children. A former children's librarian was its editor. Other publishers did the same, and now there are about 60 children's editors in New York City alone. Many had library training and experience. They knew the urgency of school demands. They understood children's likes and dislikes. They have brought out books that are useful, interesting, and extremely attractive.

The Children's Book Council is an organization of children's book editors. It promotes the annual nationwide Book Week celebration. It also sponsors book fairs in many cities and states. These fairs increase interest in good books for children, and spread information about them. The Council has headquarters at 50 W. 53rd St., New York 19, N.Y.

Children's Book Week. In 1919, The American Booksellers' Association appointed a committee with Frederic G. Melcher as chairman. This committee, composed of publishers, editors, and librarians, decided to plan a national book week, and to make a joint effort to bring more and better books to boys and girls in American

The Animals Enjoy Themselves at Babar's Fair.

From *Babar's Fair*, written and illustrated by Laurent de Brunhoff, published by Random House

Charles Scribner's Sons

This Rooster was one of the designs on the Easter eggs in *The Egg Tree* by artist-author Katherine Milhous.

homes. The Book Week proved very popular. Since 1919 it has been celebrated every year throughout the country. In 1944 there was a celebration of Book Week around the world, with Australia, Brazil, Great Britain, Mexico, Nicaragua, Panama, Russia, and the Union of South Africa cooperating. See BOOK WEEK.

Children's Book Awards

In the United States. The *John Newbery Medal* was established and endowed by Frederic G. Melcher in 1921. It is awarded for the most distinguished contribution to American literature for children written each year. The *Caldecott Medal* was established and endowed in 1937 by Frederic G. Melcher. It is given for the best-illustrated book for children published each year. Other important awards include the *New York Herald-Tribune Awards*, the *Laura Ingalls Wilder Award*, and the *Regina Medal Award*. See CALDECOTT MEDAL; NEWBERY MEDAL; REGINA MEDAL.

In Canada, the Canadian Library Association awards two *Book of the Year for Children Medals* to books chosen by the Canadian Association of Children's Librarians. Separate medals go to English and French books, but either award may be withheld if there is no book that merits it. The *Governor-General's Awards* include a medal in the field of children's literature.

In Other Countries. The *Hans Christian Andersen Medal* was established by the International Board on Books for Young People in 1956. It is the only international children's book award. France offers three prizes for children's books: the *Prix Jeunesse*, the *Grand Prix du Salon d'Enfance*, and the *Prix de la Tribune de Paris*. The *German Juvenile Book Prize* is awarded annually by the interior department of the West German government. Great Britain's Library Association awards the *Carnegie Medal* each year to the outstanding children's book by a British author published in Great Britain. In 1957, the Library Association of Great Britain established the *Kate Greenaway Medal*, an annual award for the most distinguished illustrated book for children published in Great Britain. Norway's department of education gives awards each year. The Swedish Library Association instituted the *Nils Holgersson Plaque*. The Swiss Teachers' Association also gives an annual prize.

Book Reviewing

Since it is impossible for children, parents, teachers, and librarians to read all the books published each year, many newspapers and magazines have regular departments in which children's books are reviewed by persons who can speak with authority about the relative merits of new publications.

The Bookman in 1918 was the first periodical to recognize this need. A few years later *The New York Times* and *The New York Herald-Tribune* began giving space to children's books in the book review sections of their Sunday editions. Other newspapers and periodicals soon added book departments. In 1944 *The Saturday Review of Literature* started its children's department.

From *Uncle Remus* (Trade Mark Reg. U.S. Pat. Office), *His Songs and His Sayings*, by Joel Chandler Harris, published by D. Appleton-Century Co., Inc.

Brer Rabbit Outwitted Brer Wolf in an Old Legend.

There is also *The Horn Book Magazine*, which has been published bimonthly in Boston, Mass., since 1925. It is devoted entirely to children's books and is a dependable guide. It also has a real literary flavor in its own right.

The annual Spring Festival of Children's Books was inaugurated by *The New York Herald-Tribune* in 1936 to encourage publishers to put out children's books throughout the year, not just in the Christmas season.

Current Trends in Children's Literature

In thirteen hundred years, the field of children's books has expanded until it now includes every general field of human knowledge and endeavor, from the myth to the atom. World wars and the development of atomic energy have revolutionized the thought and the way of life of mankind. Children's books are changing, along with the changing world. There is an urgency to understand each other, ourselves, our past, and our interrelationships. It is not surprising, therefore, to have children's books by archaeologists telling how people lived in ancient Troy, Egypt, Mexico, Central and South America, and the southwestern United States.

Church attendance has increased noticeably. So has the number of juvenile books about religion. It is significant that, besides books on Bible themes, there have been several that describe the ways in which God is worshiped according to the rites of different religions. One, *The Tree of Life* by Ruth Smith, contains selections from sacred writings of the world's principal religions.

World leadership has been thrust upon the United States. To help young persons understand better the problems of the world, there are books describing the functions and organization of the United Nations, and books such as Tom Galt's *Story of Peace and War* and Irmengarde Eberle's *Big Family of People*.

Several histories of other countries have been published. Filling a long-recognized need are those of China, Japan, and India. There are many new collections of folklore and mythology, which reveal the aspirations of men through the ages and often provide colorful accounts of how they lived.

From *The Tale of Peter Rabbit* by Beatrix Potter, published by Frederick Warne & Co.

Flopsy, Mopsy, and Cotton-Tail obey Mrs. Rabbit, but Peter is busily thinking about Mr. McGregor's fine garden.

Various types of scientific discoveries and developments are being clearly and factually presented for children. Often these are so well done that they are used by adults who want an understandable introduction to the subjects. They include books about atomic energy, medicine, radar and electronics, ships, and planes. The magic carpet described in the *Arabian Nights* has become the rocket ship which serious scientists believe will take them to the moon—and beyond. Boys and girls are reading these factual books, as well as science fiction, with a sense of excited anticipation because they live in an age when fiction becomes reality.

Fiction is also concerned with current social problems. The girl-meets-boy type of story popular in prewar days has disappeared. Girl still meets boy, but many of the newer books are based on such themes as prejudice against minority groups, sports problems, migrant workers, careers, orphans and their reaction to adoption, and the effect of divorce upon children.

While recognizing the changing times, we are making an effort to preserve our past. A tremendous number of books of American biography, history, folklore, and tall tales have been published. A few are excellent. But the wisest of all authors are those who do not limit themselves to one locale, but write the books of the spirit. These books contain far more than simple stories, and such books will live.

SARA H. WHEELER

Related Articles. See the lists of Authors and Illustrators for children in the BIOGRAPHY section of the READING AND STUDY GUIDE. See also the following articles:

Ballad
Bible (The Bible for Children's Use)
Book
Caldecott Medal
Encyclopedia
Epic
Fairy
Folklore
Library
Mother Goose
Mythology
Newbery Medal
Nursery Rhyme
Reading
Regina Medal
Storytelling

Mike Mulligan Tells His Steam Shovel that the town of Popperville is going to build a new town hall.

From Virginia Lee Burton's *Mike Mulligan and His Steam Shovel*, by courtesy of Houghton Mifflin Co., publishers

From Kate Seredy's *The White Stag*, published by The Viking Press, In

The Legend of the Founding of Hungary Tells of the Deeds of Attila and His Fierce Huns.

Books to Read

The following list includes five groups of titles: (1) Books for Family Reading; (2) Books for Young Children; (3) Books for the Intermediate Age; (4) Books for Older Boys and Girls; and (5) Books About Books and Reading. The selections represent recently published titles, as well as older books that have become classics. A list of Records for Listening appears at the end of the bibliography.

Books for Family Reading

ADSHEAD, GLADYS L., and DUFF, ANNIS, eds. *An Inheritance of Poetry*. Illus. by Nora S. Unwin. Houghton, 1948. Famous and little-known poets are represented in this rich collection.

ALCOTT, LOUISA MAY. *Little Women*. Illus. by Jessie Willcox Smith. Little, Brown, 1934. Many generations have loved the March family, with Meg, Jo, Beth, and Amy. An edition published by Crowell in 1955 is charmingly illustrated by Barbara Cooney.

ANDERSEN, HANS CHRISTIAN. *It's Perfectly True, and Other Stories*. Trans. from the Danish by Paul Leyssac. Illus. by Richard Bennett. Harcourt, 1938. These fairy tales, some of the most beautiful ever written, have a wide range of plot and appeal.

BARRIE, SIR JAMES M. *Peter Pan*. Illus. by Nora S. Unwin. Scribner, 1950. A boy who refuses to grow up has adventures in Never-Never Land. Many other editions of this classic are available.

BROWNING, ROBERT. *The Pied Piper of Hamelin*. Illus. by Kate Greenaway. Warne, 1938. A piper pipes the rats, and the children, out of Hamelin Town.

CARROLL, LEWIS (pseud. of CHARLES LUTWIDGE DODGSON). *Alice's Adventures in Wonderland, and Through the Looking Glass*. Illus. by John Tenniel. Macmillan, 1950. There are many other editions of this classic.

CUNNINGHAM, JULIA. *The Vision of François the Fox*. Houghton, 1960. There is a dreamlike quality in this story of a fox changed by a vision.

DE LA MARE, WALTER, ed. *Come Hither*. 3rd ed. Knopf, 1957. A famous poet has brought together his favorites for children from many authors.

DICKENS, CHARLES. *A Christmas Carol*. Illus. by Arthur Rackham. Lippincott, 1952. *The Magic Fishbone*. Illus. by F. D. Bedford. Warne, 1922. This fanciful tale by the great English novelist concerns the ingenuity and industry of Princess Alicia. Other editions of both of these classics are available.

ESTES, ELEANOR R. *The Moffats*. Illus. by Louis Slobodkin. Harcourt, 1941. *The Middle Moffat*. 1942. *Rufus M.* 1943. These delightfully realistic stories tell how a family with four lively children grows up in a small Connecticut town.

FARJEON, ELEANOR. *The Little Bookroom*. Illus. by Edward Ardizzone. Walck, 1956. This collection of the author's fanciful stories will delight all ages. Hans Christian Andersen medal winner.

FERRIS, HELEN, ed. *Favorite Poems Old and New*. Illus. by Leonard Weisgard. Doubleday, 1957. Sensitivity to what children like is reflected in this rich collection in an attractive format.

FROST, ROBERT. *You Come Too*. Holt, 1959. The beloved American poet has selected poems suitable for children from his writings.

GODDEN, RUMER. *The Dolls' House*. Viking, 1948. *The Mousewife*. 1951. *Impunity Jane*. 1954. *Mouse House*. Illus. by Adrienne Adams. 1957. *Candy Floss*. 1960. Dolls and mice as interesting as people engage the reader of these charming fantasies.

GRAHAME, KENNETH. *The Wind in the Willows*. Illus. by Ernest H. Shepard. Scribner, 1960. Small animals embody the delights of nature, friendship, and nonsense in this fantasy first published in 1908.

Green, Roger L., ed. *The Book of Nonsense.* Illus. by Charles Folkard and others. Dutton, 1956. William Shakespeare, Lewis Carroll, Edward Lear, and others are included in this laugh-provoking volume.

Hale, Lucretia P. *The Peterkin Papers.* Illus. by Harold Brett. Houghton, 1924. Boisterously funny stories concern the efforts of the ridiculous Peterkin family to become wise.

Irving, Washington. *Rip Van Winkle and The Legend of Sleepy Hollow.* Illus. by Maud and Miska Petersham. Macmillan, 1951. The story of Rip, who slept for 20 years, remains a favorite, and the tale of the headless horseman provides delightful reading at Halloween or any other time. There are many other editions of these classic American stories.

Kipling, Rudyard. *Just So Stories.* Doubleday, 1946. The author tells how the camel got his hump, the elephant his trunk, and other mysteries of nature. *The Jungle Books.* Illus. by Aldren Watson. 2 vols. 1948. All the Mowgli stories are brought together here. These classics of Kipling are also found in other editions.

Lagerlöf, Selma. *The Wonderful Adventures of Nils.* Illus. by H. Baumhauer. Pantheon, 1947. The folklore, geography, and natural history of Sweden are woven into this story of a boy transformed into a tiny person, which was first published in 1906.

Lamb, Charles and Mary. *Tales from Shakespeare.* Illus. by John C. Wonsetler. Macmillan, 1950. These classic versions of Shakespeare's stories are attractively illustrated and written so young persons can understand them. There are other good editions.

Lawson, Robert. *Rabbit Hill.* Viking, 1944. Georgie, his rabbit family, and all the other animals on the hill look forward to new folks coming. Newbery medal winner. *Tough Winter.* 1954. The folks in the big house go south for the winter, and just about everything happens.

Lear, Edward. *The Complete Nonsense Book.* Dodd, 1942. These limericks and longer story-poems provoke laughter at any age, and are found in many editions.

Lindgren, Astrid. *Pippi Longstocking.* Trans. from the Swedish by Florence Lamborn. Illus. by Louis Glanzman. Viking, 1950. Children love the unconventional conduct of this little Swedish girl who lives exactly as she pleases. *Pippi Goes on Board.* 1957. This volume continues her adventures. *Rasmus and the Vagabond.* 1960. A runaway orphan makes friends with a tramp while searching for a home. Hans Christian Andersen medal winner.

Milne, A. A. *The World of Pooh.* Dutton, 1957. This includes the two stories *Winnie-the-Pooh* (1926) and *The House at Pooh Corner* (1928) which describe the whimsical adventures of Christopher Robin's stuffed animals. *The World of Christopher Robin.* 1958. This includes the two poetry collections *When We Were Very Young* (1924) and *Now We Are Six* (1927). These poems written for the author's son are beloved wherever English is spoken.

Moore, Clement C. *The Night Before Christmas.* Illus. by Arthur Rackham. Lippincott, 1954. The magic of Christmas is captured in gay rhyme in this familiar classic. There are many other editions of this poem available.

Norton, Mary. *The Borrowers.* Illus. by Beth and Joe Kush. Harcourt, 1953. *The Borrowers Afield.* 1955. *The Borrowers Afloat.* 1959. These are enchanting English fantasies about little people who live in terror of being seen by humans, and *are.*

Read, Sir Herbert, ed. *This Way, Delight: A Book of Poetry for the Young.* Pantheon, 1956.

Ruskin, John. *The King of the Golden River.* Illus. by Mary L. Seaman. Macmillan, 1926. A fairy tale points up the age-old moral of cruelty overcome by love. This classic of the 1800's is also available in other editions.

Sharp, Margery. *The Rescuers.* Illus. by Garth Williams. Little, Brown, 1959. A richly humorous fantasy done with a light, sure touch.

Tolkien, John R. *The Hobbit; or, There and Back Again.* Houghton, 1938. This imaginative tale includes a Hobbit (smaller than a dwarf but larger than a Lilliputian), wizards, dwarfs, a dragon, and gold.

Travers, Pamela L. *Mary Poppins.* Illus. by Mary Shepard. Harcourt, 1934. *Mary Poppins Comes Back.* 1935. *Mary Poppins Opens the Door.* 1943. *Mary Poppins in the Park.* 1952. These tales of fantasy, humor, and wisdom tell the story of a nursemaid who blows in on the east wind.

Unnerstad, Edith. *The Spettecake Holiday.* Trans. by Inger Boye. Illus. by Iben Clante. Macmillan, 1958. The beauty of southern Sweden appears in this humorous book, which won the Nils Holgersson medal.

Untermeyer, Louis, ed. *This Singing World.* Harcourt, 1926. One of the finest anthologies of children's poetry.

Van Stockum, Hilda. *The Cottage at Bantry Bay.* Viking, 1938. A little dog is rescued by the children and becomes a part of the O'Sullivan family, which lives in a cottage in Ireland. *The Mitchells.* 1945. This delightful story describes a family in Washington, D.C., during World War II. An entertaining sequel is *Canadian Summer* (1948).

White, E. B. *Charlotte's Web.* Illus. by Garth Williams. Harper, 1952. Both children and adults delight in this fantasy about a spider that saves a pig's life by weaving glowing adjectives into its web.

Wilder, Laura I. *The Little House in the Big Woods.* Illus. by Garth Williams. Harper, 1953. This realistic story takes place in Wisconsin 60 years ago. *These Happy Golden Years.* 1953. This last book in the "Little House" series tells about the author's growing-up experiences.

Worth, Kathryn. *They Loved to Laugh.* Illus. by Marguerite de Angeli. Doubleday, 1942. Martita, an orphan girl, joins the family of a Quaker doctor. The five boys in the family love to laugh, and she finally learns to laugh, too.

The folk stories listed in the bibliography at the end of the Storytelling article are recommended for family reading. They are intended to be read aloud.

Books for Young Children

Anderson, Clarence W. *Billy and Blaze.* Macmillan, 1951. The first in a series of books about a boy who loves horses. A picture accompanies each sentence of text. *Blaze and the Mountain Lion.* 1959. This is the sixth book in this popular series.

Anglund, Joan W. *A Friend Is Someone Who Likes You.* Harcourt, 1958. *Love Is A Special Way of Feeling.* 1960. Many kinds of friendship and love are described in a simple text with pictures. *In a Pumpkin Shell.* 1960. There is lovely design in this

Song of the Swallows by Leo Politi tells Juan's delight in the Capistrano swallows.

Charles Scribner's Sons

A-B-C book combined with Mother Goose stories.

Ardizzone, Edward. *Tim in Danger*. Walck, 1953. *Little Tim and the Brave Sea Captain*. 2nd ed. 1955. *Tim All Alone*. 1957. Stories of the outsized adventures of a five-year-old at sea.

Ayer, Jacqueline. *A Wish for Little Sister*. Harcourt, 1960. The brilliant color and the activities of Siam provide the setting for this birthday story.

Bannerman, Helen. *The Story of Little Black Sambo*. Lippincott, 1923. Tigers and a heroic boy in India.

Bemelmans, Ludwig. *Hansi*. Viking, 1934. The Austrian Tyrol is the setting for this tale of a little boy's Christmas visit. *Madeline*. Simon & Schuster, 1939. The first in a series of charming stories in verse about a small girl in a French boarding school. *Madeline's Rescue*. Viking, 1953. Caldecott medal winner.

Beskow, Elsa M. *Pelle's New Suit*. Trans. from the Swedish by Marion L. Woodburn. Harper, 1929. From the shearing of the sheep to the completion of the new suit, industry and art go hand in hand.

Bettina (pseud. of Bettina Ehrlich). *Cocolo*. Harper, 1948. Cocolo is a little donkey who lives on a small island in Italy. *Cocolo Comes to America*. 1949. *Cocolo's Home*. 1950. Cocolo revisits Italy.

Bishop, Claire H. *Five Chinese Brothers*. Illus. by Kurt Wiese. Coward-McCann, 1938. This gay tale makes the impossible seem real, and provides fun for all the family.

Brooke, L. Leslie, illus. *Johnny Crow's Garden*. Warne, 1932. *Johnny Crow's Party*. 1932. *Johnny Crow's New Garden*. 1935. The Johnny Crow books are fun at its best. *The Golden Goose Book: Being the Stories of The Golden Goose, The Three Bears, The Three Little Pigs, and Tom Thumb*.

Brown, Marcia. *Stone Soup: An Old Tale*. Scribner, 1947. A retelling of an old favorite, this time with a French village as the setting. *Dick Whittington and His Cat*. 1950. *Puss in Boots*. 1952. *The Steadfast Tin Soldier*. 1953. *Cinderella*. 1954. Caldecott medal winner. *The Flying Carpet*. 1956. *The Three Billy Goats Gruff*. Harcourt, 1957. These are all charming picture books retelling old favorites. *Felice*. Scribner, 1958. A boy and a cat need each other in this picture book of Venice. *Tamarindo!* Scribner, 1960. This fast moving story of four ingenious little boys takes place on the island of Sicily.

Brown, Palmer. *Cheerful*. Harper, 1957. A gentle story of a church mouse who finally finds the woods he longs for.

Brunhoff, Jean de. *The Story of Babar, the Little Elephant*. Trans. from the French by Merle S. Haas. Illus. by the author. Random House, 1957. Other stories in the Babar series are also popular.

Burton, Virginia L. *Mike Mulligan and His Steam Shovel*. Houghton, 1939. Mike and Mary Anne, his steam shovel, find their way into every reader's heart. *The Little House*. 1942. The little house, originally surrounded by orchards and meadows, is finally engulfed as the city grows and takes in the nearby country. Caldecott medal winner. *Katy and the Big Snow*. 1943. Small boys especially enjoy this story of the red crawler-tractor.

Caldecott, Randolph. *Picture Books*. 4 vols. Warne. Pleasing color, simplicity of line, and energetic action make Caldecott's pictures perennial favorites. Each of the volumes includes four books. Among them are *The Farmer's Boy, The Babes in the Wood, The Frog He Would A-Wooing Go, Hey Diddle Diddle, John Gilpin, The Great Panjandrum Himself*, and *Three Jovial Huntsmen*.

Chaucer, Geoffrey. *Chanticleer and the Fox*. Adapted and strikingly illustrated by Barbara Cooney. Crowell, 1958. This is a version of the medieval classic of the 1300's by England's great storyteller. It was a Caldecott medal winner.

Chönz, Selina. *A Bell for Ursli*. Illus. by Alois Carigiet. Oxford, 1950. This is a beautiful picture tale of a small boy's life in a Swiss mountain village. *Florina and the Wild Bird*. Illus. by Alois Carigiet. 1953. Ursli's sister rescues and protects a wild ptarmigan and then sets it free.

Clark, Ann N. *In My Mother's House*. Illus. by Velino Herrera. Viking, 1941. Everyday life of the Tewa Pueblo Indians in New Mexico provides the background for an exceptional picture book.

Clark, Margery (pseud. of Mary E. Clark and Margery C. Quigley). *The Poppy Seed Cakes*. Doubleday, 1924. This gay little story of Russia contains brightly colored illustrations which were done by Maud and Miska Petersham.

Credle, Ellis. *Down, Down the Mountain*. Nelson, 1934. This story of two children in the Blue Ridge Mountains has the quality of a folk tale.

Dalgliesh, Alice. *The Bears on Hemlock Mountain*. Illus. by Helen Sewell. Scribner, 1952. A small boy finds that there are bears on Hemlock Mountain.

From *Ola*, by Ingri and Edgar Parin d'Aulaire, published by Doubleday, Doran & Co., Inc.

Ola Is a Little Boy of Norway.

Daugherty, James H. *Andy and the Lion*. Viking, 1938. A new version of the story of Androcles and the lion is full of originality and fun, with black and white pictures that are a joy.

D'Aulaire, Ingri M. and Edgar P. *George Washington*. Doubleday, 1936. *Abraham Lincoln*. 1939. *Benjamin Franklin*. 1950. Picture stories describing the lives of three great Americans.

De Regniers, Beatrice S. *A Little House of Your Own*. Illus. by Irene Haas. Harcourt, 1955. Under the dining table, in a cardboard carton, or up in a tree—such space becomes important when it is your own. Gay, too, are *Was It a Good Trade?* (1956) and *What Can You Do with a Shoe?* Harper, 1955.

Ets, Marie H. *Mister Penny*. Viking, 1935. Mr. Penny wins the gratitude of the farm animals for his kindness to them. *In the Forest*. 1944. This imaginative story is true to life, and lots of fun also. *Play with Me*. 1955. A little girl learns to make friends with the animals of the meadow. *Mister Penny's Race Horse*. 1956. Whimsical humor is at its peak when Mr. Penny's horse enters the race. *Nine Days to Christmas*. 1959. This book was written with Aurora La Bastida, and tells the story of a little Mexican girl's first *Posada*, which is the Mexican celebration of Christmas. Caldecott medal winner.

Falls, Charles B. *A B C Book.* Doubleday, 1957. This is a picture book of animals.

Farjeon, Eleanor. *Prayer for Little Things.* Illus. by Elizabeth O. Jones. Houghton, 1945. Even little drops of rain are lovingly remembered in words and pictures.

Fatio, Louise. *The Happy Lion.* Illus. by Roger Duvoisin. McGraw, 1954. A lion likes people and zoos better than wild animals in this story, and in *The Happy Lion in Africa* (1955) and in *The Happy Lion Roars* (1957).

Field, Rachel. *Prayer for a Child.* Macmillan, 1957. The author wrote this beautiful prayer for her daughter, and Elizabeth O. Jones provided the illustrations. Caldecott medal winner.

Fischer, Hans. *Pitschi, the Kitten Who Always Wanted To Be Something Else.* Harcourt, 1953. The Swiss author-artist introduces this dissatisfied cat.

Fish, Helen D. *When the Root Children Wake Up.* New ed. Lippincott, 1941. Little plants, still underground, plan their gay spring dresses in this handsome and interesting book.

Flack, Marjorie. *The Story About Ping.* Illus. by Kurt Wiese. Viking, 1933. Ping, a duck, escapes from his Chinese houseboat, but his harrowing adventures lead him to welcome the routine life he left.

Freeman, Don. *Norman the Doorman.* Viking, 1959. This is a delightful tale of a mouse who is the doorman at an art museum.

Fyleman, Rose. *Fairies and Chimneys.* Doubleday, 1920. These imaginative poems are delightful.

Gág, Wanda. *Millions of Cats.* Coward-McCann, 1928. If you read this to a child, he will almost certainly join in the rhythmic chant "Millions and billions and trillions of cats." *The A B C Bunny.* Hand-lettered by Howard Gág. 1933. Bunny finds that every letter from A to Z provides adventure. *Nothing at All.* 1941. A dog who is loved and believes in magic becomes something after all.

Gramatky, Hardie. *Little Toot.* Putnam, 1939. A little tug finds that he has to accept responsibility in this ever-popular tale.

Greenaway, Kate. *A—Apple Pie.* Warne. An alphabet book with characteristic Greenaway pictures. *Marigold Garden.* 1910. *Under the Window.* Because her children are charming and delightful, Kate Greenaway's books live on.

Grimm, Jacob Ludwig and Wilhelm Carl. *The Wolf and the Seven Little Kids.* Illus. by Felix Hoffmann. Harcourt, 1959. *Sleeping Beauty.* Illus. by Felix Hoffmann. 1960. *The Shoemaker and the Elves.* Illus. by Adrienne Adams. Scribner, 1960. These tales are freshly and imaginatively interpreted.

Hader, Berta H. and Elmer. *The Big Snow.* Macmillan, 1948. The writers tell how the birds and animals get through a long, cold winter in this interesting story. Caldecott medal winner.

Handforth, Thomas. *Mei Li.* Doubleday, 1938. Mei Li lives in northern China. Caldecott medal winner.

Ivimey, John W. *Three Blind Mice.* New ed. Warne, 1924. Utterly delightful in its humor, and in the illustrations by Walter Corbould, this book is based on the famous nursery rhyme.

Jones, Elizabeth O. *Twig.* Macmillan, 1942. This is the story of an imaginative little girl who is well acquainted with fairy folk. *Big Susan.* 1947. This charming story makes use of the old tradition that animals and toys can talk on Christmas Eve.

Joslin, Sesyle. *What Do You Say, Dear?* Illus. by Maurice Sendak. W. R. Scott, 1958. Here is a comical book on good manners. *There Is a Dragon in My Bed, and Other Useful Phrases in French and English.* Illus. by Irene Haas. Harcourt, 1961. This introduction to French is as appealing as sudden laughter.

Kahl, Virginia. *Away Went Wolfgang!* Scribner, 1954. A dog helps to provide fun in an Austrian village. *Maxie.* 1956.

From *The Story Book of Clothes* by Maud and Miska Petersham, published by The John C. Winston Co.

An Eskimo Mother Makes Clothing from Furs.

Langstaff, John M. *A Frog Went A-Courtin'.* Illus. by Feodor Rojankovsky. Harcourt, 1955. This Caldecott medal winner is a gay, colorful version of an old Scottish ballad. *Over in the Meadow.* 1957. An old rhyme takes on new charm when beautifully illustrated. *The Swapping Boy.* Illus. by Beth and Joe Krush. 1960. Here is a delightful version of an Appalachian Mountain trading song.

Lathrop, Dorothy P. *Who Goes There?* Macmillan, 1935. Little wild animals come to a picnic. *Animals of*

Two Boys Ride on a Donkey in Valenti Angelo's charming story of *The Marble Fountain.*

© 1951 by Valenti Angelo—The Viking Press, Inc.

© 1942 by Marguerite de Angeli. Reprinted by permission of Doubleday, Doran & Co., Inc.

Aniela Is the Happy Little Girl in Marguerite de Angeli's *Up the Hill.*

the Bible. Lippincott, 1937. Text selected by Helen Dean Fish from the King James Bible. Dorothy Lathrop's drawings of plants and animals of Biblical lands are beautiful and accurate. Caldecott medal winner. *Puppies for Keeps*. Macmillan, 1943. This story tells about four Pekingese puppies. *The Skittle-Skattle Monkey*. 1945. Dorothy Lathrop's humor and skill as an artist enhance the beauty of this book. *Bouncing Betsy*. 1951. A pet lamb and her wild playmates cavort in this tale. *Follow the Brook*. 1960. Pet raccoons escape from their cage and discover the unexpected pleasures of exploring the woods.

Lawson, Robert. *They Were Strong and Good*. Viking, 1940. A picture story tells of the author's pride and admiration for his parents and grandparents. Caldecott medal winner.

Leaf, Munro. *The Story of Ferdinand*. Illus. by Robert Lawson. Viking, 1936. This hilarious story describes a bull who likes to sit and smell flowers rather than fight. *Wee Gillis*. Illus. by Robert Lawson. 1938. Wee Gillis has to decide whether to live in the Highlands or Lowlands of Scotland.

Lefèvre, Félicité. *The Cock, the Mouse, and the Little Red Hen*. Illus. by Tony Sarg. Macrae Smith, 1945. The wicked fox is outwitted in this story.

Lenski, Lois. *The Little Auto*. Walck, 1934. *The Little Airplane*. 1938. *The Little Train*. 1940. *The Little Farm*. 1942. *Cowboy Small*. 1949. *Papa Small*. 1951. Small children love these books.

Lines, Kathleen, comp. *Lavender's Blue: A Book of Nursery Rhymes*. Illus. by Harold Jones. Watts, 1954. This book is soft in color and feeling, and ageless in appeal.

Lionni, Leo. *Inch by Inch*. McDowell, 1960. This striking picture book has an inchworm as its hero.

MacDonald, Golden (pseud. of Margaret W. Brown). *The Little Island*. Illus. by Leonard Weisgard. Doubleday, 1946. This story tells how the seasons and the weather affect the little island in various ways. Caldecott medal winner.

McCloskey, Robert. *Make Way for Ducklings*. Viking, 1941. A family of ducks who live on an island in the Charles River holds up Boston traffic while they waddle to the Common. Caldecott medal winner. *Blueberries for Sal*. 1948. Sal and her mother, with a bear cub and his mother, gather blueberries on the Maine coast. *One Morning in Maine*. 1952. Sal loses the first of her baby teeth, and makes a wish that comes true. *Time of Wonder*. 1957. This is a picture story of summer on a Maine island. Caldecott medal winner.

Mead, Margaret. *People and Places*. World Publishing Co., 1959. This profusely illustrated volume by a noted anthropologist shows, through a portrayal of the Eskimo, Indians, Balinese, Minoans, and Ashanti, how people have developed in various parts of the world.

Milhous, Katherine. *The Egg Tree*. Scribner, 1950. This book describes a charming Pennsylvania Dutch custom for children. Caldecott medal winner.

Minarik, Else H. *Little Bear*. Illus. by Maurice Sendak. Harper, 1957. This describes the charming adventures of a lovable bear. *Father Bear Comes Home*. 1959. *Little Bear's Friend*. 1960. New adventures told in a gently humorous text.

Mother Goose. *Ring o' Roses: A Nursery Rhyme Picture Book*. Illus. by L. Leslie Brooke. Warne. *The Tenggren Mother Goose*. Little, Brown, 1956. This gay Mother Goose is illustrated by Gustaf Tenggren in a modern manner. *The Real Mother Goose*. Illus. by Blanche F. Wright. New ed. Rand McNally, 1941. *Mother Goose: Seventy-Seven Verses with Pictures by Tasha Tudor*. Walck, 1944. There are many other good versions of Mother Goose.

Munari, Bruno. *Bruno Munari's ABC*. World Publishing Co., 1960. Beauty and imagination are combined in this enchanting picture book.

Newberry, Clare T. *April's Kittens*. Harper, 1940. April lives in an apartment with room for only one cat. When Sheba, the cat, has kittens, April wants to keep them all and life becomes complicated.

Petersham, Maud F. and Miska. *The Rooster Crows: A Book of American Rhymes and Jingles*. Macmillan, 1945. This lively book of games and songs has long been a favorite. Caldecott medal winner.

Potter, Beatrix. *The Tale of Peter Rabbit*. Warne, 1904. This is the first in a delightful series of books about familiar animals. The illustrations have a delicate beauty.

Mary Poppins, the Amazing Nursemaid for the Banks children, "blows in with an east wind," carrying her luggage with her.

A Mary Shepard illustration from P. L. Travers' *Mary Poppins*, published by Harcourt Brace

Kate Seredy's illustration from *Caddie Woodlawn*, by Carol Ryrie Brink, by permission of The Macmillan Co., publishers

Life for a Girl and Her Two Brothers on the Wisconsin frontier was full of excitement.

Rey, Hans A. *Curious George*. Houghton, 1941. *Curious George Takes a Job*. 1947. *Cecily G. and the 9 Monkeys*. 1942. A mischievous monkey has nonsensical adventures.

Robbins, Ruth. *Baboushka and the Three Kings*. Illus. by Nicolas Sidjakov. Parnassus, 1960. An old Russian folk tale is delightfully retold and illustrated with striking pictures. Caldecott medal winner.

Rossetti, Christina. *Sing-Song: A Nursery Rhyme Book for Children*. Illus. by Marguerite Davis. Macmillan, 1952. The simple verses of this classic of the 1800's make this an appealing volume.

Sawyer, Ruth. *Journey Cake, Ho!* Illus. by Robert McCloskey. Viking, 1953. This mountain folk tale tells how Johnny chases the Journey Cake all the way home.

Sayers, Frances C. *Bluebonnets for Lucinda*. Illus. by Helen Sewell. Viking, 1934. This is a story about a Texas girl. *Tag-Along Tooloo*. Illus. by Helen Sewell. 1941. A five-year-old proves to her older sisters and friends that she is worth taking along on their activities.

Seuss, Dr. (pseud. of Theodore Seuss Geisel). *And To Think That I saw It on Mulberry Street*. Vanguard, 1937. Rhyme, pictures, and story combine to make this a favorite with small children. *The 500 Hats of Bartholomew Cubbins*. 1938. When Bartholomew takes off one hat, another always appears in its place. *Horton Hatches the Egg*. Random House, 1940. The elephant who sits on the vacationing bird's egg is faithful one hundred per cent! *The Cat in the Hat*. 1957. *The Cat in the Hat Comes Back!* 1958.

Sewell, Helen. *Blue Barns: The Story of Two Big Geese and Seven Little Ducks*. Macmillan, 1933. This gentle tale of farm life has genuine beauty and an unforgettable appeal.

Stevenson, Robert Louis. *A Child's Garden of Verses*.

Reprinted from *Four Corners of the World* by Roger Duvoisin, © 1948 Alfred A. Knopf, Inc. By permission of Alfred A. Knopf.

Spanish Daring and Adventure highlight Roger Duvoisin's *Four Corners of the World*, a tale of the days of Pizarro.

Illus. by Jessie Willcox Smith. Scribner, 1955. This classic has become almost as well known as Mother Goose. There are many editions available.

Thompson, Blanche J., comp. *Silver Pennies: A Collection of Modern Poems for Boys and Girls*. Macmillan, 1925.

Udry, Janice M. *A Tree Is Nice*. Illus. by Marc Simont. Harper, 1956. Leaves, limbs, and shade provide fun for children and animals. Caldecott medal winner.

Ward, Lynd K. *The Biggest Bear*. Houghton, 1952. Johnny's baby bear grows and grows until it becomes a real problem. Delightful humor and robust pictures make this a popular favorite with many children. Caldecott medal winner.

Wiese, Kurt. *You Can Write Chinese*. Viking, 1945. A fascinating book that clarifies the essentials of Chinese characters. *Fish in the Air*. 1948. Written and illustrated to reflect the spirit of Chinese culture, this charming story tells of a boy named Fish and his gifts, which are always shaped like fish.

Yashimo, Taro (pseud. of Jun Iwamatsu). *The Crow Boy*. Viking, 1955. A lonesome Japanese boy's unusual talent is discovered just in time. *Umbrella*. 1958. Momo, a Japanese girl who receives red boots and an umbrella for her third birthday, eagerly waits for a rainy day.

Books for the Intermediate Age

Alcott, Louisa May. *Little Men*. Illus. by Reginald Birch. Little, Brown, 1934. This sequel to *Little Women* tells of the boys' school conducted by Jo and her husband. Other editions are available.

Atwater, Richard and Florence. *Mr. Popper's Penguins*. Little, Brown, 1948. Illus. by Robert Lawson. Mr. Popper brings up a family of penguins in a refrigerator. It all seems perfectly plausible.

Bailey, Carolyn S. *Miss Hickory*. Illus. by Ruth Gannett. Viking, 1946. A displaced person (a doll with an apple twig body and hickory nut head) finds friends and a new home.

Baudouy, Michel A. *Old One-Toe*. Harcourt, 1959. This is a suspenseful story of a wily fox, a boy, and an elderly man.

Berna, Paul. *The Horse Without a Head*. Trans. from the French by John Buchanan-Brown. Illus. by Richard Kennedy. Pantheon, 1958. A group of Parisian children recover their most cherished plaything, and also discover a great train robbery. Winner of the Grand Prix du Salon d'Enfance (the grand prize for children's literature in France).

Bishop, Claire H. *Twenty and Ten*. Illus. by William Pène du Bois. Viking, 1952. Twenty French children succeed in hiding 10 Jewish refugee children from the Nazis. This is based on a true story and told with deep sympathy and understanding.

Bland, Edith N. *The Story of the Treasure Seekers: Being the Adventures of the Bastable Children in Search of a Fortune*. New ed. Coward-McCann, 1948. *The Wouldbegoods*. New ed. 1948. *The New Treasure Seekers*. New ed. 1948. Illustrations by C. Walter Hodges enliven the texts of these ever-popular stories.

Bowman, James C. *Pecos Bill, the Greatest Cowboy of All Time*. Illus. by Laura Bannon. Whitman, 1937. These hilarious, impossible tales have as their hero a famous character of American folklore.

Brink, Carol Ryrie. *Caddie Woodlawn*. Illus. by Kate Seredy. Macmillan, 1935. Caddie is a lively and enterprising member of a Wisconsin pioneer family. Newbery medal winner. *The Magical Melons*. Illus. by Marguerite Davis. 1944. This contains more about Caddie and her brothers.

Brooks, Walter R. *Freddy Goes to Florida*. Illus. by Kurt Wiese. Knopf, 1949. First published as *To and*

James Daugherty's illustration for *Daniel Boone: Wilderness Scout*, by Stewart Edward White, published by Doubleday, Page & Co.

Daniel Boone Escapes from the Indians.

Again. Freddy the pig and other animals follow the birds south for the winter and have many adventures.

Burnett, Frances Hodgson. *The Secret Garden.* Lippincott, 1949. A garden brings friendship and rosy cheeks to a sickly English girl in this book, first published in 1911.

Carlson, Natalie S. *The Family Under the Bridge.* Illus. by Garth Williams. Harper, 1958. A family of red-haired children moves into the shelter of Armand the hobo, and ends his carefree days. *A Brother for the Orphelines.* Illus. by Garth Williams. 1959. This is a warmly human story of French orphans.

Chase, Alice E. *Famous Paintings: An Introduction to Art for Young People.* Platt, 1951. Fine reproductions in color of the world's greatest paintings appear in this book.

Chrisman, Arthur. *Shen of the Sea.* Illus. by Else Hasselriis. Dutton, 1925. A distinguished collection of Chinese stories. Newbery medal winner.

Clark, Ann N. *The Secret of the Andes.* Illus. by Jean Charlot. Viking, 1952. This book presents a sensitive interpretation of the life of an Inca boy. Newbery medal winner.

Cleary, Beverly. *Henry Huggins.* Illus. by Louis Darling. Morrow, 1950. *Ellen Tebbits.* 1951. *Beezus and Ramona.* 1955. *Henry and the Paper Route.* 1957. These and other stories about Henry and the other neighborhood children in a small town are realistic and engagingly humorous.

Coatsworth, Elizabeth J. *The Cat Who Went to Heaven.* Illus. by Lynd K. Ward. New ed. Macmillan, 1958. Newbery medal winner.

Coblentz, Catherine C. *The Blue Cat of Castle Town.* Illus. by Janice Holland. Longmans, 1949. This enchanting bit of Americana tells about a blue cat that sets out to find a hearth to fit his song. A tapestry depicting this legend hangs in the Metropolitan Museum in New York City.

Collodi, Carlo (pseud. of Carlo Lorenzini). *The Adventures of Pinocchio.* Trans. from the Italian by Carol Della Chiesa. With illus. after Attilio Mussino. Macmillan, 1951. Astonishing adventures befall a wooden marionette in this story. There are many editions of this classic which was first published in 1883.

Dalgliesh, Alice. *The Courage of Sarah Noble.* Illus. by Leonard Weisgard. Scribner, 1954. Colonial Connecticut is seen by an eight-year-old. *The Thanksgiving Story.* Illus. by Helen Sewell. 1954. *The Columbus Story.* Illus. by Leo Politi. 1955. *The Fourth of July Story.* Illus. by Marie Nonnast. 1956. Three lovely picture books tell about these holidays. *Ride on the Wind.* Illus. by Georges Schreiber. 1956. This book tells the story of Charles A. Lindbergh's flight across the Atlantic Ocean.

Daugherty, James H. *Daniel Boone.* Illus. by the author. Viking, 1939. This book, written in rhythmic prose, places a national hero accurately in his historical setting. Newbery medal winner.

De Angeli, Marguerite L. *Henner's Lydia.* Doubleday, 1936. Picturesque Amish children of Pennsylvania enliven this book. *Yonie Wondernose.* 1944. Yonie, a seven-year-old Amish boy, is left in charge at home while his father is away. *The Door in the Wall.* 1949. This story concerns Robin de Bureford, who is a 10-year-old cripple and the son of a knight of Edward III of England. Newbery medal winner.

DeJong, Meindert. *Shadrach.* Harper, 1953. This story tells of a little boy's devotion to a black rabbit. *The Wheel on the School.* 1954. Children provide storks with a nesting place in this story of a Dutch village. Newbery medal winner. *The Little Cow and the Turtle.* 1955. A friendship grows up between two animals. *The House of Sixty Fathers.* 1956. In this story, a Chinese boy and his pet pig are taken from his parents into Japanese-occupied territory. *Along Came a Dog.* Illus. by Maurice Sendak. 1958. A homeless dog becomes the protector of a hen who lost her toes.

Charles Scribner's Sons

Science Fiction is at its best in *Between Planets* by Robert Heinlein. This illustration is by Clifford Geary.

De La Mare, Walter. *Rhymes and Verses.* Illus. by Elinore Blaisdell. Holt, 1947. This is a collection of the author's poems for young people.

Dodge, Mary M. *Hans Brinker, or the Silver Skates.* Illus. by Hilda van Stockum. World Publishing Co., 1946. This famous tale is one of the best stories of life in The Netherlands. There are other editions of this classic available.

Du Bois, William Pène. *The Great Geppy.* Viking, 1940. Mystery and laughter have a circus setting. *The Twenty-One Balloons.* 1947. A diamond mine and other great surprises await the Professor. Newbery medal winner.

Duvoisin, Roger. *Four Corners of the World.* Knopf, 1948.

Eager, Edward M. *Half Magic.* Illus. by N. M. Bodecker. Harcourt, 1954. A coin grants half of any wish, and situations arise which provoke surprise and laughter. *Magic or Not?* 1959. What happens to Laura and her twin brother could be coincidence, but . . .

Eaton, Jeanette. *Narcissa Whitman, Pioneer of Oregon.* Illus. by Woodi Ishmael. Harcourt, 1941. This inspiring and interesting story of a great woman is told with understanding.

Eberle, Irmengarde. *Big Family of Peoples.* Crowell, 1952. This history of the people of the world from the Neolithic Age to the present day is based on the theme that all men are brothers.

Edmonds, Walter D. *Matchlock Gun.* Illus. by Paul Lantz. Dodd, 1941. Edward Alstyne, a 10-year-old boy, guards his family's home in colonial Albany against marauding Indians. Newbery medal winner.

Enright, Elizabeth. *Thimble Summer.* Farrar, Straus, 1938. Garnet finds a silver thimble, and all summer her life on the farm is full of happy experiences. Newbery medal winner. *The Melendy Family.* Rinehart,

Climbing a Tree, boys and girls discover many wonderful things they can do—from playing pirate to just sitting and thinking. Marc Simont won the Caldecott medal in 1957 for his illustrations for *A Tree Is Nice.*

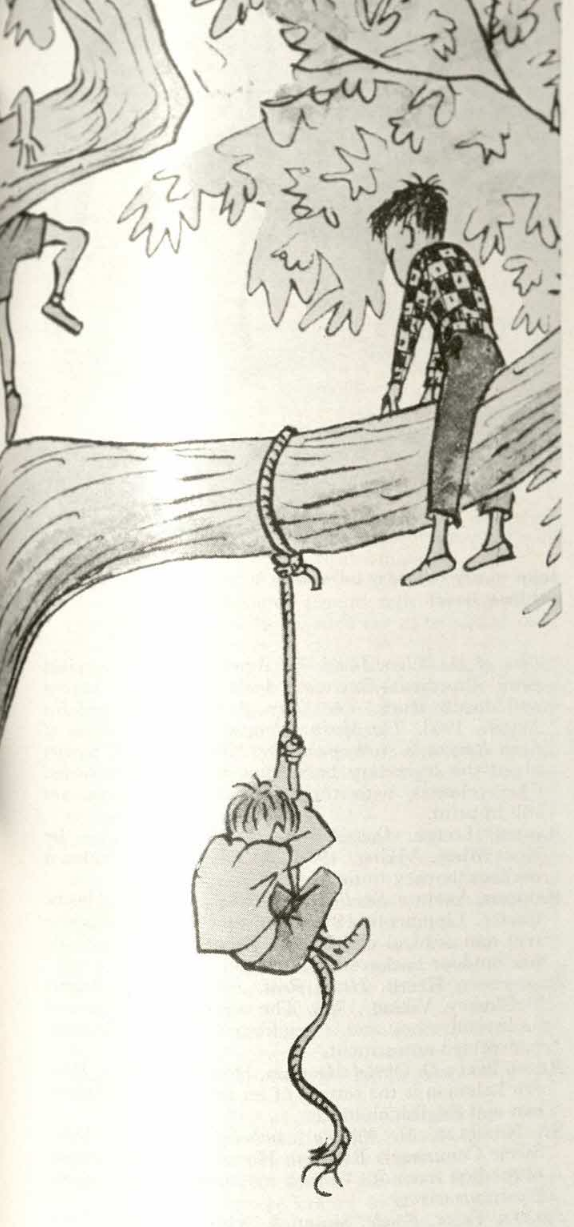
From *A Tree Is Nice* by Janice May Udry, illustrated by Marc Simont, and published by Harper & Bros.

1947. The four Melendy children explore New York City. *Gone-Away Lake*. Illus. by Beth and Joe Krush. Harcourt, 1957. An unusual summer vacation story told with charm and humor.

FINGER, CHARLES J. *Tales from Silver Lands*. Illus. with woodcuts by Paul Honoré. Doubleday, 1931. These stories were collected in South America. Newbery medal winner.

FITCH, FLORENCE M. *One God: The Ways We Worship Him*. Lothrop, 1944. This graphic presentation of the religion of Roman Catholics, Protestants, and Jews should do much to promote understanding and good will. *Their Search for God: Ways of Worship in the Orient.* 1947. This book tells about Hindus in India, Confucianists and Taoists in China, Shintoists in Japan, and Buddhists throughout Asia. *Allah, the God of Islam: Moslem Life and Worship.* Illus. with photographs selected by Beatrice Creighton and the author. 1950. This volume tells about one of the world's great religions.

FOSTER, GENEVIEVE S. *Birthdays of Freedom: America's Heritage from the Ancient World.* Scribner, 1952. The



author wrote this book at the request of the American Library Association to commemorate its 75th birthday. It ties in with the Association's birthday theme of America's heritage of freedom, and strengthens the conviction that freedom belongs to people everywhere and in all times. *Birthdays of Freedom: From the Fall of Rome to July 4, 1776.* 1957.

Freuchen, Pipaluk. *Eskimo Boy.* Trans. from the Danish. Illus. by Ingrid Vang Nyman. Lothrop, 1951. The daughter of a famous explorer tells this simple, forthright story of life among the Eskimos.

Gannett, Ruth S. *My Father's Dragon.* Illus. by Ruth Chrisman Gannett. Random House, 1948. Extravagant nonsense is characteristic of this story of a boy who rescues a baby dragon after many adventures with other animals.

Gates, Doris. *Blue Willow.* Illus. by Paul Lantz. Viking, 1940. The Larkins flee from the Dust Bowl to find a new home, where they are finally able to put their most cherished possession, a blue willow plate, over the mantelpiece. *Sensible Kate.* Illus. by Marjorie Torrey. 1943. Kate, an orphan, finds a home with a family that needs someone sensible in the household. *Little Vic.* Illus. by Kate Seredy. 1951. This story is about a little colt and a jockey's son who finally rides the colt to victory in a race.

George, John L. and Jean C. *Vulpes, the Red Fox.* Illus. by Jean George. Dutton, 1948. This is a story about a wild fox in the Maryland woods. *Vision, the Mink.* 1949. *Masked Prowler: The Story of a Raccoon.* 1950. These two stories combine beautiful writing and a sound knowledge of wildlife. *Dipper of Copper Creek.* 1956. A boy discovers a stubby-tailed gray bird near a Colorado ghost town.

Hawthorne, Nathaniel. *A Wonder Book, and Tanglewood Tales.* Illus. by Gustaf Tenggren. Houghton, 1923. Many other editions of these classic American stories are available. These books, in which many Greek myths are retold, have remained favorites throughout the years.

Henry, Marguerite. *Misty of Chincoteague.* Illus. by Wesley Dennis. Rand McNally, 1947. Two Virginia children have adventures with a wild pony's colt. *King of the Wind.* 1948. This tells about the Arabian ancestor of Man o' War. Newbery medal winner. Also engrossing is *Sea Star, Orphan of Chincoteague* (1949). *Justin Morgan Had a Horse.* 1954. This biography of the first Morgan horse in Vermont is also a touching story of a man and a boy. *Gaudenzia, Pride of the Palio.* Illus. by Lynd K. Ward. Rand McNally, 1960. This exciting story of a Tuscan farm boy and a part-Arabian horse is set in medieval Italy.

Hodges, C. Walter. *Columbus Sails.* Coward-McCann, 1939. This vivid account of the great explorer makes his life and times seem real.

Holbrook, Stewart H. *America's Ethan Allen.* Illus. by Lynd K. Ward. Houghton, 1949. This is a vigorous account of the part the Green Mountain Boys played in the Revolutionary War.

Holling, Holling C. *Paddle-to-the-Sea.* Houghton, 1941. A little canoe starts its journey from Lake Nipigon in Canada, paddles through the Great Lakes and the St. Lawrence River, and after four years reaches the sea. *Tree in the Trail.* 1942. This book tells the story of a cottonwood landmark of the pioneers. *Minn of the Mississippi.* 1951. Minn is a turtle who travels the length of the Mississippi from Lake Itasca in Minnesota to the Gulf of Mexico. *Pagoo.* 1957. This is the life of a crab. These volumes are all favorites with young readers.

Jewett, Eleanore M. *The Hidden Treasure of Glaston.* Illus. by Frederick T. Chapman. Viking, 1946. Two boys search for King Arthur's treasure.

Johnson, Gerald. *America Grows Up.* Illus. by Leonard E. Fisher. Morrow, 1960. This book completes the trilogy of American history by an eminent journalist begun with *America Is Born* (1959), and continued with *America Moves Forward* (1960).

Judson, Clara I. *Abraham Lincoln: Friend of the People.* Follett, 1950. *George Washington: Leader of the People.* 1951. *Thomas Jefferson: Champion of the People.* 1952. *Mr. Justice Holmes.* 1956. *Benjamin Franklin.* 1957. These fine biographies are illustrated by Robert Frankenberg.

Kalnay, Francis. *Chúcaro: Wild Pony of the Pampa.* Illus. by Julian de Miskey. Harcourt, 1958. There is gentle humor in this story of Argentina.

Kästner, Erich. *Emil and the Detectives.* Trans. by May Massee. Illus. by Walter Trier. Doubleday, 1930. In this book, boys become amateur detectives.

Kipling, Rudyard. *Captains Courageous.* Doubleday, 1949. A poor little rich boy is rescued from himself and from the sea after being washed overboard from a fishing vessel. There are many other editions available of this classic.

Knight, Eric. *Lassie Come-Home.* Illus. by Cyrus L.

Baldridge. Winston, 1940. This is the ever-popular story of a devoted collie dog and his master, set in Yorkshire and Scotland.

Krumgold, Joseph. . . . *And Now Miguel*. Illus. by Jean Charlot. Crowell, 1953. A New Mexico sheep farm is the home in which Miguel proves that he is really grown up. Newbery medal winner. *Onion John*. 1959. This is another story of a boy's growing up, set in a midwestern town. Newbery medal winner.

Lang, Andrew, ed. *The Blue Fairy Book*. Longmans, 1948. This and the other classic "color" fairy books delight young readers with folk tales of many lands.

Lawson, Robert. *Ben and Me: A New and Astonishing Life of Benjamin Franklin, as Written by His Good Mouse Amos*. Little, Brown, 1939. The supposed author of this book is a remarkable mouse who lives in Ben's old fur cap and tells a delightful story.

Lenski, Lois. *Bayou Suzette*. Lippincott, 1943. Life on the bayous of Louisiana unfolds in this tale. *Strawberry Girl*. 1945. This book presents an amusing and understanding story of Florida "crackers." Newbery medal winner. *Judy's Journey*. 1947. This story of a family that follows the crops is one of the best in the author's regional series.

Lewis, C. S. *The Lion, the Witch and the Wardrobe*. Illus. by Pauline Baynes. Macmillan, 1950. This and the other books in the series about the land of Naria are full of a magic that is completely different and entertaining to the readers.

Lofting, Hugh. *The Story of Doctor Dolittle: Being the History of His Peculiar Life at Home and Astonishing Adventures in Foreign Parts*. Lippincott, 1920. This delightful nonsense contains more than a grain of truth. *The Voyages of Doctor Dolittle*. 1922. Further adventures of the amazing little doctor. Newbery medal winner. *Doctor Dolittle and the Secret Lake*. 1948. *Doctor Dolittle and the Green Canary*. 1950. These volumes continue the humorous Dr. Dolittle stories.

Malcolmson, Anne B. *Yankee Doodle's Cousins*. Illus. by Robert McCloskey. Houghton, 1941. Some real and lengendary heroes of American folklore appear in this entertaining book.

McCloskey, Robert. *Homer Price*. Viking, 1943. Homer's adventures are all hilarious and include catching robbers, running a doughnut machine, and many other interesting exploits.

McSwigan, Marie. *Snow Treasure*. Illus. by Mary R. Reardon. Dutton, 1942. Directed by their elders, Norwegian children carry gold bullion on their sleds under the noses of Nazi guards. The children take it to ships riding at anchor so that it can be transported out of the country to safety.

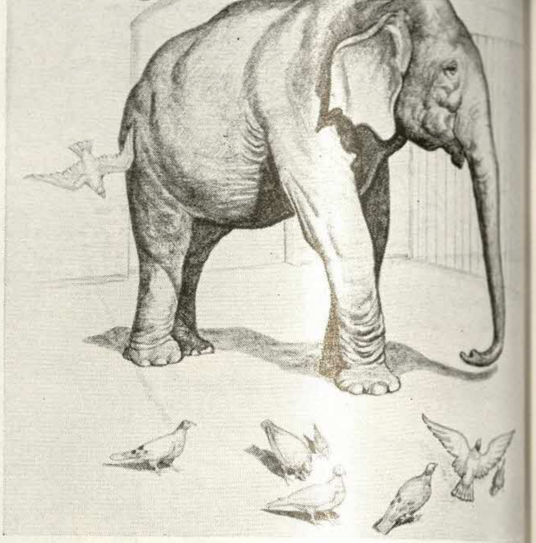
Mukerji, Dhan Gopal. *Kari, the Elephant*. Illus. by J. E. Allen. Dutton, 1922. This tells the story of the life of an elephant from the time he is six months old. *Hari, the Jungle Lad*. Illus. by Morgan Stinemetz. 1924. The life of a boy who lives on the edge of the jungle in eastern India. *Gay Neck: The Story of a Pigeon*. Illus. by Boris Artzybasheff. 1927. A homing pigeon, trained in India, serves with valor in World War I. Newbery medal winner.

O'Dell, Scott. *Island of the Blue Dolphins*. Houghton, 1960. A young Indian girl struggles for survival alone on an island off the California coast. Newbery medal winner.

Otis, James (pseud. of James Otis Kaler). *Toby Tyler, or, Ten Weeks with a Circus*. Illus. by R. H. Rodgers. Harper, 1936. This story of circus life, first published in 1880, is still popular, and still ranks as one of the best.

Parrish, Anne. *Floating Island*. Harper, 1930. This is an amusing and imaginative doll story.

Pyle, Howard. *Men of Iron*. Harper, 1891. This is a tale of chivalry at the time of Henry IV of England.



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John Henry has many adventures in *Lost in the Zoo* by Berta and Elmer Hader.

Otto of the Silver Hand. Scribner, 1903. This vivid story of medieval Germany deals with robber barons and deadly feuds. *The Story of King Arthur and His Knights*. 1903. *The Merry Adventures of Robin Hood of Great Renown in Nottinghamshire*. New ed. 1946. Stories about this legendary hero have long been favorites. These classics, with their famous illustrations, are still in print.

Rankin, Louise. *Daughter of the Mountains*. Illus. by Kurt Wiese. Viking, 1948. A Tibetan girl makes a perilous journey to find her dog.

Ransome, Arthur. *Swallows and Amazons*. Illus. by Helene Carter. Lippincott, 1931. Ransome's stories describe real and natural children in situations that provide fine outdoor backgrounds on land and sea.

Robertson, Keith. *Henry Reed, Inc*. Illus. by Robert McCloskey. Viking, 1958. The summer enterprises of an inventive boy and a neighborhood friend provide unexpected amusement.

Rugh, Belle D. *Crystal Mountain*. Houghton, 1955. Modern Lebanon is the setting of an adventure of American and English children.

St. Nicholas. *St. Nicholas Anthology*. Ed. by Henry Steele Commager. Random House, 1948. A selection of the best from *St. Nicholas* magazine in its long and illustrious career.

Salten, Felix. *Bambi*. Simon & Schuster, 1955. This is a beloved life story of a forest deer.

Sandburg, Carl. *Abe Lincoln Grows Up*. Illus. by James H. Daugherty. Harcourt, 1940. This selection from *Abraham Lincoln: The Prairie Years* describes the early life of Lincoln with sympathy, vigor, and appeal for readers.

Sawyer, Ruth. *Roller Skates*. Illus. by Valenti Angelo. Viking, 1936. A lively little girl with a gift for friendship roller-skates in the New York City of the 1890's. Newbery medal winner. *The Least One*. Illus. by Leo Politi. 1941. The "least one" is a burro, "soft and gray and good-for-nothing." His being lost and his return make an engaging story.

Selden, George. *The Cricket in Times Square*. Illus. by Garth Williams. Ariel, 1960. A mouse and a cat help a country cricket adjust to life in a New York subway station.

Seredy, Kate. *The Good Master*. Viking, 1935. When the author was a little girl, she lived on a ranch in Hungary like the one described here. *The Singing Tree*. 1939. A sequel to *The Good Master*. *The White Stag*. 1937. The story of the invasion of Europe by Attila and the Huns is retold in dramatic prose. *A Tree for Peter*. 1941. This beautifully illustrated Christmas story tells of a small boy, a tramp, and the Shantytown people.

SETON, ERNEST THOMPSON. *Wild Animals I Have Known*. New ed. Scribner, 1942. First published in 1898, these are short stories about animals.

SHANNON, MONICA. *Dobry*. Illus. by Atanas Katchamakoff. Viking, 1934. Dobry is a Bulgarian peasant boy. Only his wise grandfather understands his desire to become a sculptor in this story of Bulgaria before World War II. Newbery medal winner.

SHARP, EDITH L. *Nkwala*. Illus. by William Winter. Little, Brown, 1958. This story tells of the Salish Indians of the Pacific Northwest. Little, Brown, Canadian Juvenile Book award winner.

SHIPPEN, KATHERINE B. *Leif Eriksson: First Voyager to America*. Harper, 1951. Viking life and customs are authentically portrayed in this well-written biography of the famous Leif and his equally famous father, Eric the Red.

SORENSEN, VIRGINIA. *Miracles on Maple Hill*. Harcourt, 1956. Living close to nature brings many miracles to this family. Newbery medal winner.

SPERRY, ARMSTRONG. *Call It Courage*. Macmillan, 1940. This South Sea Island legend tells the story of a chief's son and how he learned not to be afraid. Newbery medal winner.

SPYKMAN, E. C. *Terrible, Horrible Edie*. Harcourt, 1960. The activities of the Cares family begun in *A Lemon and a Star* (1955) and continued in *Wild Angel* (1957) are full of vivid action and humor.

SPYRI, JOHANNA. *Heidi*. The story of Heidi, her grandfather, and others who live in an Alpine village has been a favorite for many years. There are many editions available.

STEELE, WILLIAM O. *Daniel Boone's Echo*. Harcourt, 1957. This tells of a search for legendary creatures with Daniel Boone. *Lone Hunt*. 1956. *Perilous Road*. 1958. Each word counts in these vivid stories set against American historical backgrounds.

STEVENSON, ROBERT LOUIS. *Kidnapped*. Illus. by N. C. Wyeth. Scribner, 1913. This stirring classic tells of a boy's adventures in Scotland in the 1700's. *Treasure Island*. 1947. This beautiful edition of one of the greatest of all pirate stories is illustrated in color by N. C. Wyeth. These two novels, which were first published in the 1880's, are available in many other good editions.

STOLZ, MARY S. *A Dog on Barkham Street*. Harper, 1960. A boy, a hobo uncle, and a collie provide the ingredients for this extraordinarily moving story.

STONG, PHIL. *Honk the Moose*. Illus. by Kurt Wiese Dodd, 1955. A moose comes to a Minnesota town for food during a heavy snow, and provides amusing situations.

TWAIN, MARK (pseud. of SAMUEL L. CLEMENS). *The Adventures of Tom Sawyer*. *The Adventures of Huckleberry Finn*. These two classics, which were first published in 1876 and 1884, should be a part of every young reader's heritage. There are many editions of both available.

VANCE, MARGUERITE. *Martha, Daughter of Virginia: The Story of Martha Washington*. Illus. by Nedda Walker. Dutton, 1947. This engrossing story tells of the childhood and adult life of the wife of the first President of the United States. *Ashes of Empire: Carlotta and Maximilian of Mexico*. Dutton, 1960. Courts and intrigues, as in her biographies of European royalty, are here convincingly portrayed against a background of historical events.

WINTERFELD, HENRY. *Castaways in Lilliput*. Illus. by William Hutchinson. Harcourt, 1960. Three Australian children discover Lilliput in this entertaining and humorous story.

WYSS, JOHANN DAVID. *The Swiss Family Robinson*. This tale of the many-sided resourcefulness of a shipwrecked family first appeared in Zurich, Switzerland, in 1813. It resembles Daniel Defoe's *Robinson Crusoe*, but appeals to younger children, and has remained a favorite throughout the years. There are many other editions available.

Books for Older Boys and Girls

BAITY, ELIZABETH. *Americans Before Columbus*. Illus. by C. B. Falls. Viking, 1951. The ways of life, customs, and destinies of peoples on the American continent before Columbus' discovery are accurately pictured here.

BAUMANN, HANS. *The Barque of the Brothers: A Tale of the Days of Henry the Navigator*. Walck, 1958. This adventure tale of the 1400's is one of danger, courage, and loyalty, and is rich in historical background. *Sons of the Steppe*. 1958. The life of Mongol warriors is depicted in this engrossing tale of the lives of two dissimilar grandsons of Genghis Khan.

BEERS, LORNA. *The Book of Hugh Flower*. Harper, 1952. This story of medieval England tells how a journeyman rises to success in his guild.

BELL, MARGARET E. *Watch for a Tall White Sail*. Morrow, 1948. Alaska in 1887 calls for bravery from a 16-year-old girl.

BENARY-ISBERT, MARGOT. *The Ark*. Trans. by Clara and Richard Winston. Harcourt, 1953. A family in Germany starts over again after World War II.

BENNETT, JOHN. *Master Skylark: A Story of Shakespeare's Time*. Illus. by Reginald B. Birch. Grosset, 1947. A kidnaped boy in one of his many adventures in Elizabethan England meets William Shakespeare.

BOYD, JAMES. *Drums*. Illus. by N. C. Wyeth. Scribner, 1947. Excitement and adventure have a North Carolina setting in this classic novel of the early days of the Revolutionary War.

BRONTË, CHARLOTTE. *Jane Eyre*. Illus. by Helen Sewell. Oxford, 1938. This novel, published in 1847, tells of a girl's romance set in a dramatic and turbulent background.

BUNYAN, JOHN. *The Pilgrim's Progress*. There are many editions of this classic, published in 1678, which describes a Christian's search for salvation.

Life of the Incas is the theme of *Secret of the Andes*, illustrated by Jean Charlot.

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From Thomas Handforth's *Mei Li*, published by Doubleday, Doran & Co., Inc.

Two Children of North China Attend a Fair.

Carson, Julia M. *Son of Thunder, Patrick Henry.* Longmans, 1945. Patrick Henry at his thundering best appears in this fine biography that makes him seem alive.

Carson, Rachel. *The Sea Around Us.* Illus. by Katherine L. Howe. Oxford, 1951. The author describes the wonderful world of marine life. *The Edge of the Sea.* Houghton, 1955.

Caudill, Rebecca. *The Tree of Freedom.* Illus. by Dorothy B. Morse. Viking, 1949. The hardships of homesteading in the United States in the 1780's cannot overcome this family's determination to find freedom and a better life.

Ceram, C. W. (pseud. of Kurt W. Marek). *Gods, Graves, and Scholars: The Story of Archaeology.* Knopf, 1951. The author gives fascinating information about some fascinating discoveries.

Cervantes Saavedra, Miguel de. *Don Quixote de la Mancha.* Retold by Judge Parry. Illus. by Walter Crane. Dodd. This Spanish classic of the 1600's is a satire on the romantic tales of valiant knights.

Chute, Marchette. *The Innocent Wayfaring.* Dutton, 1943. Chaucer's England provides the setting for this story of revolt and romance. *An Introduction to Shakespeare.* 1951. The playwright, his work, and his times all come alive in this sprightly and scholarly account. *Stories from Shakespeare.* World Publishing Co., 1956. A retelling of 36 plays of Shakespeare.

Clark, Ann N. *Santiago.* Illus. by Lynd K. Ward. Viking, 1955. A Guatemalan boy is torn between life with his own people and life with his new white friends.

Coolidge, Olivia. *Winston Churchill and the Story of Two World Wars.* Houghton, 1960. A balanced account of a man who helped shape history.

Cooper, James Fenimore. *The Deerslayer. The Last of the Mohicans. The Spy.* Detailed description slows the action, but Cooper's novels are still enjoyable. There are many editions in print of these classic American novels.

Curie, Eve. *Madame Curie.* Trans. by Vincent Sheean. New ed. Heinemann, 1958. The story of the discoverer of radium is told with vividness and fascinating detail by her daughter.

Dana, Richard Henry. *Two Years Before the Mast.* Longfellow's son-in-law wrote this classic story of a trip around Cape Horn to California on a sailing ship. There are many editions.

Darwin, Charles. *The Voyage of the Beagle.* Abridged and edited by Millicent E. Selsam. Harper, 1959. The spirit of the original is unusually well preserved in this version.

Daugherty, James H. *Abraham Lincoln.* Viking, 1943. *Of Courage Undaunted: Across the Continent with Lewis and Clark.* 1951. The author has illustrated this robust and fascinating account of the Lewis and Clark Expedition.

Davis, Julia. *No Other White Men.* Maps by Caroline Gray. Dutton, 1937. The diaries of Lewis and Clark were used in writing this picturesque tale of a great overland trip of exploration.

Day, Clarence. *The Best of Clarence Day.* Knopf, 1948. Includes Day's popular humorous books *God and My Father*, *Life with Father*, *Life with Mother*, and *This Simian World.* It also includes selections from *Thoughts Without Words.*

Defoe, Daniel. *Robinson Crusoe.* Illus. by N. C. Wyeth. Scribner, 1957. First published in 1719, this book still ranks among the world's great adventure stories.

DeMille, Agnes. *Dance to the Piper.* Little, Brown, 1952. This is the fascinating autobiography of an American dancer.

Doyle, Sir Arthur Conan. *The Complete Sherlock Holmes.* 2 vols. Doubleday, 1953. Doyle began the famous Sherlock Holmes series with *A Study in Scarlet* in 1887, and continued it with other short stories and novels. There are many editions of the individual books available.

Dumas, Alexandre. *The Count of Monte Cristo.* Illus. by Mead Schaeffer. Dodd. This is a slightly abridged version of the dramatic story of a sailor's revenge set in an historical background. There are other editions of this, and of Dumas' other historical romances available.

Eaton, Jeanette. *Leader by Destiny: George Washington, Man and Patriot.* Illus. by Jack M. Rosé. Harcourt, 1938. This fine biography shows the results of careful research, and is warmly human. *Lone Journey: The Life of Roger Williams.* Illus. by Woodi Ishmael. 1944. *That Lively Man, Ben Franklin.* Illus. by Henry C. Pitz. Morrow, 1948.

Forbes, Esther. *Johnny Tremain.* Illus. by Lynd K. Ward. Houghton, 1943. Johnny Tremain lives in Boston in 1774, and has some exciting experiences before the Revolutionary War. Newbery medal winner. *America's Paul Revere.* Illus. by Lynd K. Ward. 1946. Sound scholarship and skill in storytelling combine to make this an unusual and entertaining story of the Revolutionary War.

Forbes, Kathryn. *Mama's Bank Account.* Harcourt, 1943. This story is rich in humor and family feeling.

Forester, C. S. *Captain Horatio Hornblower.* Illus. by N. C. Wyeth. Little, Brown, 1939. This trilogy describes the exciting adventures of Captain Hornblower, and is written by one of the finest writers about the sea.

Foster, Genevieve S. *George Washington's World.* Scribner, 1941. *Abraham Lincoln's World.* 1944. *Augustus Caesar's World.* 1947. *The World of Captain John Smith.* 1959. The author writes about the events that took place both in America and in other parts of the world when Washington, Lincoln, Augustus Caesar, and John Smith were living.

Frank, Anne. *The Diary of a Young Girl.* Trans. from the Dutch by B. M. Mooyaart. Doubleday, 1952. This young Jewish girl, with a perception far beyond her years, records her family's life in hiding during the Nazi occupation of The Netherlands. This diary was discovered after her death. It gives a touchingly beautiful picture of the mind and heart of a sensitive girl.

Fuller, Iola. *The Loon Feather.* Harcourt, 1940. The decline of her way of life is seen through the eyes of

Oneta, the great-granddaughter of an Ojibway chief.

George, Jean C. *My Side of the Mountain*. Dutton, 1959. This is a convincing chronicle of a young boy who tries to live off the land amid the Catskills.

Godden, Rumer. *Hans Christian Andersen: A Great Life in Brief*. Knopf, 1955.

Goudge, Elizabeth. *The Little White Horse*. Coward-McCann, 1947. There are mystery and poetry in this dramatic search for the causes of a family feud. *The Dean's Watch*. 1960. Man's relationships with man and with God are the subject of this romantic English novel.

Gray, Elizabeth Janet. *Young Walter Scott*. Viking, 1935. *Penn*. 1938. The author can be depended on to combine historical accuracy and beautiful literary style. *Adam of the Road*. Illus. by Robert Lawson. 1942. This is a story of England in the 1200's. Newbery medal winner. *Windows for the Crown Prince*. Lippincott, 1952. This book was written after the author spent several years in Japan as the teacher of Crown Prince Akihito. It was published under her married name, Elizabeth Gray Vining.

Hamre, Leif. *Leap into Danger*. Harcourt, 1959. *Edge of Disaster*. 1960. The hazards encountered by Norwegian air force pilots provide exciting reading.

Harnett, Cynthia. *Nicholas and the Wool-Pack*. Putnam, 1953. This is an exceptionally readable historical novel set in England in the 1400's.

Hawes, Charles B. *The Mutineers*. Little, Brown, 1920. *The Great Quest*. Illus. by George Varian. 1921. *The Dark Frigate*. Illus. by Anton O. Fischer. 1925. A sea story of the 1600's. Newbery medal winner.

Heinlein, Robert. *Between Planets*. Scribner, 1951.

Jackson, Helen Hunt. *Ramona*. Illus. by N. C. Wyeth. Little, Brown, 1939. This is a tragic Indian love story first published in 1884.

James, Will. *Lone Cowboy: My Life Story*. Scribner, 1930. This is the readable autobiography of a picturesque cowboy-soldier-artist. *Smoky, the Cow-Horse*. 1954. The spirit of the cattle country lives on in this vigorous story. Newbery medal winner.

Keith, Harold V. *Rifles for Watie*. Illus. by Peter Burchard. Crowell, 1957. A young boy's part in the Civil War broadens his understanding. Newbery medal winner.

Kelly, Eric P. *The Trumpeter of Krakow: A Tale of the 15th Century*. Illus. by Angela Pruszynska. Macmillan, 1928. The Polish tradition of courage and bravery marks this exciting retelling of an incident of the 1400's. Newbery medal winner.

Kipling, Rudyard. *Puck of Pook's Hill*. Doubleday, 1906. *Rewards and Fairies*. 1910. In the guise of fairy tales, these two volumes cover the field of English history from the Norman Conquest to the time of Napoleon. *Stalky & Co*. 1899. Stalky, Beetle (Kipling himself), and MacTurk keep an English boarding school in a constant state of uproar. *Verse*. 1940. Young people respond to Kipling's vigorous and colorful poetry.

Kjelgaard, Jim. *Big Red*. Illus. by Bob Kuhn. Holiday, 1956. An Irish setter and his owner, Danny, roam the wilderness tracking a bear. Nature backgrounds appear in all of Kjelgaard's stories. Some of his other favorites are *Snow Dog* (1948), *Haunt Fox* (1954), *Wolf Brother* (1957), *Boomerang Hunter* (1960), and *The Duck-Footed Hound* (Crowell, 1960).

Lewis, Elizabeth F. *Young Fu of the Upper Yangtze*. Winston, 1932. A former resident of China is the author of this excellent story of modern China, illustrated by Kurt Wiese. Newbery medal winner. *Ho-ming, Girl of New China*. 1934. Ho-ming has to overcome the prejudices of her family in order to study and work in an American hospital.

Lindbergh, Anne Morrow. *North to the Orient*. Maps by Charles A. Lindbergh. Harcourt, 1949. This account of the Lindberghs' pioneering trip to China, following the Great-Circle Route, is written in the author's poetic prose and with her profound awareness of the spiritual values of life.

London, Jack. *The Call of the Wild*. A Saint Bernard dog in the Klondike, obeying "the call of the wild," becomes the leader of a wolf pack. This story was first published in 1903 and is still available in many editions.

MacLean, Alistair. *H.M.S. Ulysses*. Doubleday, 1956. The hazards of life on a British cruiser during World War II make dramatic reading.

Masefield, John. *Jim Davis*. Macmillan, 1951. An exciting story of smuggling off the Devonshire coast of England. *Salt-Water Poems and Ballads*. Illus. by Charles Pears. New ed. 1953. Both of these favorites are from the early 1900's.

McGraw, Eloise. *Moccasin Trail*. Coward-McCann, 1952. The reorientation of a white boy brought up with Indians is told with skill and conviction.

Meader, Stephen W. *Red Horse Hill*. Harcourt, 1930. Dairy farming in New Hampshire becomes a reality for Bud when his horse wins a race. *Boy with a Pack*. 1939. A boy traveling on foot in Vermont, New York, Pennsylvania, and Ohio in 1837 has many adventures. *The Long Trains Roll*. Illus. by Edward Shenton. 1944. An enemy attempt at sabotage.

Meigs, Cornelia L. *Invincible Louisa*. Little, Brown, 1933. This biography of Louisa May Alcott is illustrated with photographs of her family. Newbery medal winner.

Melville, Herman. *Moby Dick, or The Whale*. This allegory of man's struggle with fate is also a classic description of whaling. It was first published in 1851 and is available in many editions.

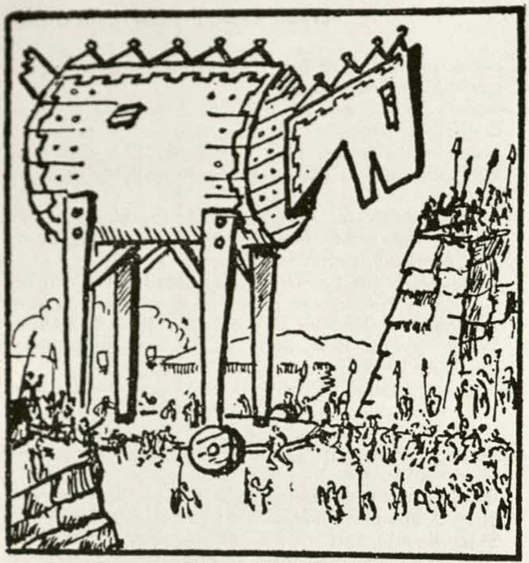
Moody, Ralph. *Little Britches: Father and I Were Ranchers*. Illus. by Edward Shenton. Norton, 1950. This story tells of a New England family's adjustment to ranch life.

Moorehead, Alan. *No Room in the Ark*. Harper, 1959. The landscape and wildlife of south and east Africa are here depicted with great literary skill.

Mühlenweg, Fritz. *Big Tiger and Christian*. Illus. by Rafaello Busoni. Pantheon, 1952. This picturesque and fascinating tale recounts the adventures of two boys, one English and one Chinese, in the Gobi Desert while on a mission for a Chinese general.

A Kurt Wiese illustration for *Young Fu of the Upper Yangtze* by Elizabeth Lewis, published by John C. Winston Co.

Young Fu Watches His Father Work in the Rice Fields.



From *The Story of Mankind* by Hendrik Van Loon, published by Liveright Publishing Corp.

The Trojan Horse Stands Outside the Walls of Troy.

Nordhoff, Charles, and Hall, James Norman. *The Bounty Trilogy*. Little, Brown, 1936. The strange story of H.M.S. *Bounty* and Captain Bligh's 3,600-mile trip in an open boat after his crew mutinied is based on British Admiralty records. *The Hurricane*. 1936. This is another South Sea adventure story.

Norton, André (pseud. of Alice M. Norton). *Huon of the Horn*. Harcourt, 1951. The Duke of Bordeaux was defeated by Charlemagne but achieved fame and glory through Oberon, the elf king.

Ollivant, Alfred. *Bob, Son of Battle*. Illus. by Marguerite Kirmse. Grosset, 1950. Even difficult dialect does not keep children from loving this story of a noble sheep dog.

Parkman, Francis. *The Oregon Trail*. This account of Parkman's adventures in 1846 along part of the Oregon Trail, and his encounters with the Sioux, is an American classic, available in many editions.

Petry, Ann. *Harriet Tubman, Conductor on the Underground Railroad*. Crowell, 1955. Three hundred slaves find freedom through a heroic woman's help in this fascinating historical account.

Poe, Edgar Allan. *Tales of Mystery and Imagination*. Poe's tales date from the middle 1800's, and their fascination is as great now as it was then. There are many editions of them in print.

Rawlings, Marjorie Kinnan. *The Yearling*. Illus. by Edward Shenton. Scribner, 1952. This story of a boy and his pet fawn on a lonely farm in Florida is told with both insight and understanding. Pulitzer prize winner.

Roberts, Kenneth. *Northwest Passage*. Doubleday, 1937. This exciting story relates the adventures of Robert Rogers during the French and Indian War and his later attempts to find the Northwest Passage.

Roos, Ann. *Man of Molokai: The Life of Father Damien*. Illus. by Raymond Lufkin. Lippincott, 1943. This is a fine biography of the priest who devoted his life to a leper colony.

Rourke, Constance M. *Davy Crockett*. Illus. by James MacDonald. Harcourt, 1955. The life of one of the most colorful frontiersmen is told with accurate detail and humor.

Saint-Exupéry, Antoine de. *The Little Prince*. Trans. from the French by Katherine Woods. Harcourt, 1943. This imaginative and philosophical story was written by the French aviator a short time before his death in World War II. *Wind, Sand and Stars*. Trans. from the French by Lewis Galantière. Illus. by John O'Hara Cosgrave. 1949. There is beauty in this story of flight.

Sandoz, Mari. *The Horsecatcher*. Westminster, 1957. The author of the adult novel *Old Jules* tells for young people the story of an Indian youth who finds horse-catching more challenging than the war path.

Scott, Sir Walter. *Ivanhoe*. Illus. by E. Boyd Smith. Houghton. This is an attractive edition of this still popular story of the time of Robin Hood and King Richard Coeur de Lion. *The Talisman*. Illus. by A. Thieme. 1927. This stirring story of the Third Crusade has King Richard and Saladin as characters.

Shippen, Katherine B. *New Found World*. Viking, 1945. This is an authentic presentation of the peoples, nations, and cultures of Latin America. *The Great Heritage*. Illus. by C. B. Falls. 1947. The development of the United States in terms of its natural resources unfolds in a book of lasting value. It is full of facts and anecdotes richly rewarding to its readers. *The Bright Design*. 1949. This introduces the men and women who revealed the secrets of electricity. *Passage to America*. Harper, 1950. This describes the peoples who came to America. *A Bridle for Pegasus*. Viking, 1951. This book describes man's dreams of flying. *Men, Microscopes, and Living Things*. Illus. by Anthony Ravielli. 1955. This describes the lives and works of great biologists. *Miracle in Motion*. Harper, 1955. This book depicts 300 years of American industry.

Smith, Ruth P., ed. *The Tree of Life: Selections from the Literature of the World's Religions*. Illus. by Boris Artzybasheff. Viking, 1942. This book is useful in a home library and contains selections from the sacred writings of the American Indians, Norsemen, Hindus, Buddhists, Confucianists, Taoists, Egyptians, Babylonians, Greeks, Zoroastrians, Hebrews, Christians, and Moslems, complete with notes on background material.

Speare, Elizabeth G. *The Witch of Blackbird Pond*. Houghton, 1958. This historical romance is set in early colonial Connecticut. Newbery medal winner.

Sperry, Armstrong. *Danger to Windward*. Winston, 1947. Nantucket just following the War of 1812 is the setting of this exciting whaling adventure. *Rain Forest*. Macmillan, 1947. Bird collecting in New Guinea leads to capture by pygmies.

Stefansson, Vilhjalmur. *Hunters of the Great North*. Harcourt, 1922. In this early book on Arctic exploration, Stefansson tells of the fascination of the Arctic and the possibilities for comfortable and profitable living there.

Steinbeck, John. *The Pearl*. Illus. by José Clemente Orozco. Viking, 1947. This story of a family is based on an old Mexican folk tale.

Stolz, Mary. *The Seagulls Woke Me*. Harper, 1951. An over-protected, shy girl develops independence at her uncle's Maine inn.

Sutcliff, Rosemary. *The Silver Branch*. Illus. by Charles Keeping. Walck, 1958. This exciting and well-written story takes place in Roman Britain. *The Lantern Bearers*. 1959. This moving tale describes a Roman who became fond of England during the Roman occupation.

Swift, Hildegarde H. *The Edge of April*. Illus. by Lynd K. Ward. Morrow, 1957. This is a fine biography of the naturalist John Burroughs.

Swift, Jonathan. *Gulliver's Travels*. Illus. by Arthur Rackham. New ed. Dutton, 1952. This classic story was first published in 1726.

Tarkington, Booth. *Seventeen*. Harper, 1932. This famous story by an American humorist portrays with understanding the trials and tribulations of youth and young love. *Penrod*. Doubleday, 1935. Penrod is inevitably compared with Tom Sawyer—a real American boy true to his environment.

Trease, Geoffrey. *Web of Traitors: An Adventure Story* *of Ancient Athens*. Vanguard, 1952. Democracy in the days of Socrates in ancient Athens provides the theme of this swift-paced adventure story.

Tunis, John R. *All-American*. Illus. by Hans Walleen. Harcourt, 1942. Tunis has written a number of school sports stories. This one centers around football and school rivalries.

Twain, Mark (pseud. of Samuel L. Clemens). *The Prince and the Pauper*. What happens when ragged little Tom Canty exchanges clothes with the boy who becomes Edward VI of England is told with typical Twain zest and humor.

Van Loon, Hendrik Willem. *The Story of Mankind*. New enl. ed. Liveright, 1951.

Verne, Jules. *Twenty Thousand Leagues Under the Sea*. Illus. by W. J. Aylward. Scribner, 1925. Verne imagined the submarine in the 1800's, long before it came into being. This book and its sequel, *The Mysterious Island* (World Publishing Co., 1957), are still popular adventure stories. There are many editions of these and his other books in print.

Waldeck, Theodore J. *The White Panther*. Illus. by Kurt Wiese. Viking, 1941. This is an authentic and dramatic story of a South American panther. *Treks Across the Veldt*. Illus. by Ivan T. Sanderson. 1944. This book of adventure and hairbreadth escapes describes explorations in Africa in search of animals, large and small, for zoos and laboratories.

West, Jessamyn. *Cress Delahanty*. Illus. by Joe Krush. Harcourt, 1953. How growing up presents difficulties. *The Friendly Persuasion*. Movie ed. 1956. This is a story about a Quaker family in Indiana in the 1800's.

White, Anne T. *Lost Worlds: Adventures in Archaeology*. Random House, 1941. Archaeological finds re-create four lost civilizations.

Wibberley, Leonard. *Peter Treegates's War*. Ariel, 1960. This, like the author's other books, is packed with action, war, prisoners, and escapes.

Wister, Owen. *The Virginian*. First published in 1902, this book describes how a handsome cowboy brings order to his community.

Yates, Elizabeth. *Amos Fortune, Free Man*. Illus. by Nora S. Unwin. Dutton, 1950. This inspiring biography tells about a Negro slave who bought his freedom. Newbery medal winner. *Patterns on the Wall*. 1953. This story of a journeyman painter in New England in 1816 is a love story for older girls.

Books About Books and Reading

Arbuthnot, May H. *Children and Books*. Rev. ed. W. R. Scott, 1957. This is a comprehensive survey of the major types of good literature available for children, with numerous examples. It suggests ways in which teachers, librarians, and parents can influence children in their use of worth-while books.

Becker, May Lamberton. *Adventures in Reading*. New ed. Lippincott, 1946. A widely read critic of children's books tells in an informal style of her joys and enthusiasms in the use of books.

Duff, Annis. *Bequest of Wings: A Family's Pleasures with Books*. Viking, 1944. Two wise parents share their children's interests from infancy through junior high school and provide them with a broad cultural background of literature, poetry, art, music, natural history, homemaking, and humor. *Longer Flight: A Family Grows Up with Books*. 1955. Mrs. Duff discusses all kinds of books in this continued account of her children's reading through the high school years.

Eaton, Anne T. *Reading with Children*. Viking, 1940. A librarian and book critic shares her reading adventures with children and young people. *Treasure for the Taking: A Book List for Boys and Girls*. Rev. ed. 1957. This annotated bibliography is arranged by subject under many headings.

Fenner, Phyllis. *The Proof of the Pudding: What Children Read*. Day, 1957. Children's reactions are the basis for the recommendation of the books here. *Something Shared: Children and Books*. 1959. This is a compilation of articles and excerpts from books and cartoons about children's reading.

Hazard, Paul. *Books, Children and Men*. Trans. by Marguerite M. Mitchell. 3rd ed. The Horn Book, 1948. This account of children's books throughout the world is one-sided, but inspirational.

Larrick, Nancy. *A Parent's Guide to Children's Reading*. Doubleday, 1958. This is a practical guide for newcomers to the field of children's books and is available in a pocket edition. *A Teacher's Guide to Children's Books*. Merrill, 1960. This is a survey of children's books discussed according to grade level and curriculum units of study.

Meigs, Cornelia L., and others. *A Critical History of Children's Literature: A Survey of Children's Books in English from Earliest Times to the Present*. Macmillan, 1953.

Smith, Irene. *A History of the Newbery and Caldecott Medals*. Viking, 1957. The author evaluates the winning books, and gives a history of the awards.

Smith, Lillian. *The Unreluctant Years: A Critical Approach to Children's Literature*. American Library Association, 1953.

Records for Listening

Phonograph records make available many works of children's literature which are read by distinguished actors. The vividness with which famous characters of fiction have been re-created adds another dimension to literature. It also encourages families to read books and poems aloud.

The following selection is only a partial listing. It includes only some of the examples of children's literature which can be used to supplement and encourage reading. Full listings of the records available can be found in record catalogs and also at stores where records are sold.

Alexander Hamilton and Aaron Burr; Trappers and Traders of the Far West. Enrichment Records. These scenes from American history are dramatized in an authentic manner. Other Enrichment Records cover many episodes in American history.

American Folk Tales and Songs. Told by Richard Chase; sung by Jean Ritchie and Paul Clayton. Tradition. Mr. Chase tells six regional stories of English-Ameri-

From *The Fairy Circus* by Dorothy P. Lathrop, by permission of The Macmillan Co., publishers

A White, Winged Mouse Poses as a Statue with a Fairy.

can origin, and Jean Ritchie and Paul Clayton sing mountain melodies of the South.

ANDERSEN, HANS CHRISTIAN. *The Little Match Girl and Other Andersen Tales.* Caedmon. Boris Karloff continues two earlier Caedmon recordings of Andersen's fairy tales by reading several stories here.

As I Have Heard Tell . . . and *English Nursery Rhymes.* Recited and sung by Vivienne Stenson. Folkways.

BROWNING, ROBERT. *The Pied Piper of Hamelin,* and CARROLL, LEWIS. *The Hunting of the Snark.* Caedmon. Boris Karloff reads Browning's famous poem and Lewis Carroll's thought-provoking nonsense.

CARROLL, LEWIS. *Alice in Wonderland.* Riverside. Cyril Ritchard reads Alice's adventures on four records in this excellent complete recording.

CARROLL, LEWIS, and LEAR, EDWARD. *Nonsense Verse of Carroll and Lear.* Caedmon. Three distinguished actors—Beatrice Lillie, Cyril Ritchard, and Stanley Holloway—read the brilliant comic verses of two favorite writers for children.

CERVANTES SAAVEDRA, MIGUEL DE. *Don Quixote.* Mentor. Walter Starkie reads a number of selections from his own translation of *Don Quixote,* including such famous passages as "The Windmills" and "Don Quixote's Last Days and Epitaph."

DICKENS, CHARLES. *A Christmas Carol.* Caedmon. Sir Ralph Richardson takes the part of Scrooge in this dramatization of Dickens' Christmas favorite.

GILBERT, SIR WILLIAM. *Bab Ballads,* and BELLOC, HILAIRE. *Cautionary Tales.* Caedmon. Stanley Holloway reads selections from the *Bab Ballads,* and Joyce Grenfell reads 15 of Belloc's poems. These verses are sophisticated and nonsensical, and will appeal to young people in junior and senior high school.

GRAHAME, KENNETH. *The Wind in the Willows.* Pathways. On two records, narrators who include Hume Cronyn and his wife, Jessica Tandy, read the adventures of Toad, Rat, Mole, and the many other delightful characters of Grahame's classic.

HAWTHORNE, NATHANIEL. *Tales of Hawthorne.* Caedmon. Basil Rathbone reads two of Hawthorne's stories which probe into the problems of guilt in the human mind, "The Minister's Black Veil" and "Young Goodman Brown." Stories for high school students.

The Mayflower Compact; George Washington's Farewell Address. Enrichment Records. This record dramatizes two great scenes in American history: the signing of the Mayflower Compact and Washington's Farewell Address in a vivid and authentic form.

MOTHER GOOSE. There are many good recordings of the verses of Mother Goose. One Caedmon record, performed with great skill, has poems read by three distinguished actors—Cyril Ritchard, Celeste Holm, and Boris Karloff.

POE, EDGAR ALLAN. *Tales of Poe.* Caedmon. Basil Rathbone reads "The Cask of Amontillado," "The Facts in the Case of M. Valdemar," and "The Pit and the Pendulum" with dramatic suspense. These stories are intended for high school students.

Poetry Readings by Dame Peggy Ashcroft. London. The poems on this record are for high school students. They include selections from Browning, Edward Lear, Tennyson, Keats, Shelley, and Shakespeare.

SANDBURG, CARL. *Rootabaga Stories.* Caedmon. The author reads these modern fairy tales for children.

Outline

- **I. The History of Children's Literature**
  - A. The Early Beginnings
  - B. The Middle English Period
  - C. The Renaissance
  - D. Puritan Times
  - E. The 1700's
  - F. The 1800's
  - G. Period of Change
  - H. 1850-1900
- **II. Special Collections**
- **III. English Illustrators of Children's Books**
- **IV. American Illustrators of Children's Books**
- **V. What Makes a Good Children's Book?**
- **VI. Children's Librarians**
- **VII. Young People's Librarians**
- **VIII. Children's Editors**
  - A. The Children's Book Council
  - B. Children's Book Week
- **IX. Children's Book Awards**
  - A. In the United States
  - B. In Canada
  - C. In Other Countries
- **X. Book Reviewing**
- **XI. Current Trends in Children's Literature**
- **XII. Books to Read**
  - A. Books for Family Reading
  - B. Books for Young Children
  - C. Books for the Intermediate Age
  - D. Books for Older Boys and Girls
  - E. Books About Books and Reading
  - F. Records for Listening

Questions

What contribution to children's literature did Alfred the Great make?

By whom was the first encyclopedia for children written?

How was the *Boke of Curtesye* divided?

What was a hornbook? How and why was it used?

Who published the first illustrated book for children? What was it called?

What part did John Newbery play in developing literature for children?

Why did many early authors of children's stories not sign their own names?

How did each of the following help to improve children's literature: (a) Charles and Mary Lamb? (b) the Grimm brothers? (c) Washington Irving? (d) Edward Lear?

What illustrator became famous for his illustration of Dickens' books? as the illustrator of *Alice's Adventures in Wonderland?*

Who started Book Week? Where is it celebrated?

What is the Newbery medal and to whom is it awarded? For what is the Caldecott medal given?

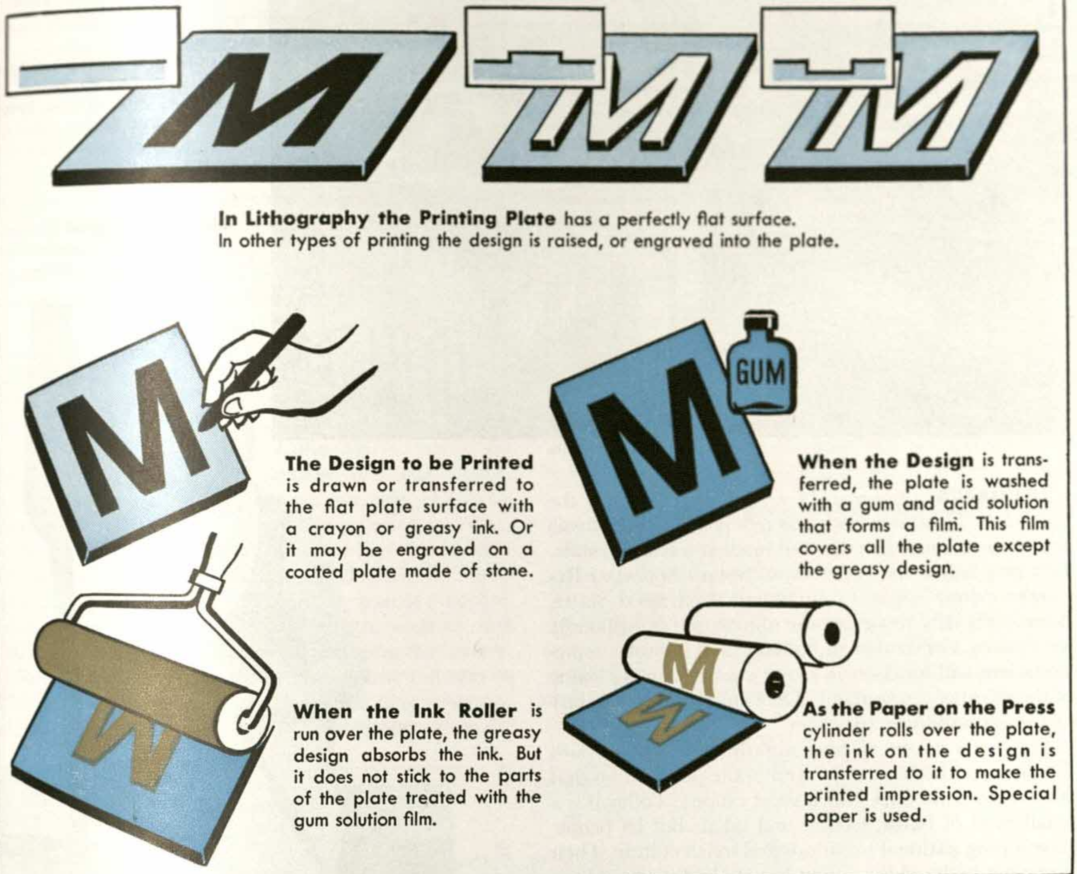
What are some other important awards for children's literature?

LITHARGE, *LITH ahrj,* or **LEAD MONOXIDE** (chemical formula, PbO), is a yellow or brownish-red solid, a compound of lead and oxygen. It is made by heating lead or certain of its compounds in air. Litharge is widely used in making flint glass and lenses, and rubber. It is also a pigment for paints.

LITHIUM (chemical symbol, Li), is a soft, silver-white metallic element that is the lightest known metal. Lithium is only half as heavy as water. It will float on petroleum. When cut, lithium has a silvery luster, but it soon darkens when exposed to air. Lithium is softer than lead, but harder than sodium. When it is put in water, it frees hydrogen in the liquid. This made it important during World War II as a source of hydrogen for the antenna balloons used with emergency radio sets. Postwar research on lithium established it as valuable in the production of porcelain, castings, air-conditioning systems, fungicides, bleaching agents, greases, and pharmaceuticals, and in welding. It had also a major use in research on the hydrogen bomb.

Lithium is never found in a pure state. It is usually deposited with other metals in pegmatite ore. Small amounts of the metal are also contained in blood, milk, water, leaves, and meteorites. Lithium's atomic weight is 6.940, and its atomic number is 3. It has a specific gravity of 0.534. It was discovered in 1817 by Johann August Arfvedson of Sweden. HARRISON ASHLEY SCHMITT

PRINCIPLES OF LITHOGRAPHY



In Lithography the Printing Plate has a perfectly flat surface. In other types of printing the design is raised, or engraved into the plate.

The Design to be Printed is drawn or transferred to the flat plate surface with a crayon or greasy ink. Or it may be engraved on a coated plate made of stone.

When the Design is transferred, the plate is washed with a gum and acid solution that forms a film. This film covers all the plate except the greasy design.

When the Ink Roller is run over the plate, the greasy design absorbs the ink. But it does not stick to the parts of the plate treated with the gum solution film.

As the Paper on the Press cylinder rolls over the plate, the ink on the design is transferred to it to make the printed impression. Special paper is used.

LITHOGRAPHY, *lih THAHG ruh fih,* is the process of printing from flat surfaces. The process is also called *planographic printing*. It is based on the principle that oil and water do not mix. Aloys Senefelder of Germany first applied the principle to printing in 1796. He discovered that a certain kind of porous stone absorbed both oil and water. He drew on the stone with a greasy crayon and dampened the stone with water. The stone absorbed the water only where there was no crayon. Senefelder rolled oily printing ink over the stone. The ink adhered only to the crayon. The damp part of the stone repelled the ink. When Senefelder pressed a sheet of paper against the stone, he could transfer the inked design to the paper.

Lithographic stones are a porous variety of calcium carbonate, found chiefly in Bavaria. They are three to four inches thick and range in size from six by eight inches to 44 by 64 inches.

Commercial Lithography is the most important form of lithography today. It is used for printing books, magazines, and newspapers, and for many other kinds of printing work. Metal plates such as aluminum or zinc replace stone in commercial work. Metal plates are flexible, of uniform quality, and less likely to break. Because metal is not porous, its surface must be roughened to make water hold to it. The metal surface is also sensitized. The image of words and pictures to be printed is applied to it by a photographic process, called *photolithography*. The prepared metal plate is then wrapped around a cylinder. It is dampened and inked. The ink sticks only to the words and pictures, and the image is transferred to the paper.

In *offset* lithography, the printing plate transfers the inked image to another, rubber-covered cylinder. The rubber cylinder transfers the words and pictures to the paper, glass, cloth, or other material to be printed. See OFFSET.

Color lithography is used extensively to reproduce paintings, color photographs, and other representations in natural color. Each color requires a separate printing plate. Ordinarily, not more than four or five are used.

Lithography as a Fine Art developed soon after Senefelder's invention, and has continued to the present day. Artists use crayons, pens, and brushes to apply their designs to lithographic stones. They also draw them on paper and press them onto the stones. Prints from stones may be pressed onto other stones, and prints made from them. Sheet music was once printed in this way. Many artists, including George Bellows and Adolf Dehn, are noted for their fine lithographs. S. W. HAYTER

See also CURRIER AND IVES; ENGRAVING; PRINTING.

LITHOSPHERE. See EARTH (The Land Areas).

LITHUANIA

Kaunas, a leading industrial city, served as the capital of Lithuania from 1920 to 1939.

Lithuanian Legation

Distaffs Are Used by Lithuanian women for spinning yarn for their families' clothing.

Ewing Galloway

LITHUANIA, *LITH yoo AY nih uh*, is a land on the Baltic Sea. Lithuania once was independent, but Russia seized the country in 1940 and made it a Russian state. It is now called the LITHUANIAN SOVIET SOCIALIST REPUBLIC. Many countries, including the United States, do not officially recognize the annexation of Lithuania by Russia. Lithuanian diplomatic and consular representatives still function in many countries in the name of their former government. The capital and largest city of Lithuania is Vilnius.

Lithuania covers an area slightly larger than South Carolina, with about 15 per cent more people than that state. Lithuania once was a great empire. Today it is a small land of farms, forests, and lakes. But its people have strong national traditions and a rich culture. Their language is the oldest living tongue in Europe. Many Lithuanians have fled their homeland to live in other countries. There are more than 1,000,000 persons of Lithuanian descent in the United States.

The Land and Its Resources

Location, Size, and Surface Features. Lithuania lies south of Latvia on the Baltic Sea. It is mostly a flat land, with highlands only in the southeast and southwest. The Nemunas River and its branches drain most of the country. The *Map* shows that the Nemunas empties into the Courland Lagoon, a long, land-locked bay that makes up part of the country's 60-mile coast line. Lithuania has more than 2,000 lakes, but none is large or important. Lithuania covers 31,200 square miles.

FACTS IN BRIEF

Type of Government: A state of Russia.

Capital: Vilnius.

Area: 31,200 square miles. *Greatest distance:* (east-west) 210 miles; (north-south) 120 miles. *Coast line*, 60 miles.

Elevation: *Highest*, 948 feet, near the Byelorussian border; *lowest*, sea level.

Population: 2,713,000. *Density*, about 85 persons to the square mile. *Distribution*, rural, 81 per cent; urban, 19 per cent.

Chief Products: *Agriculture*, barley, cattle, flax, oats, pigs, potatoes, rye, sheep, wheat. *Forest Products*, birch, fir, pine. *Manufacturing and Processing*, agricultural and forest products, electrical motors and appliances, machinery.

Natural Resources. The chief natural resources of Lithuania are its fertile soil and its forests of pine, fir, and birch. Lithuania has no minerals, but the Baltic washes up valuable supplies of amber on its shores (see AMBER). The Baltic also provides herring and other fish.

Climate. Temperatures in Lithuania average 20° F. in January and 60° F. in July. About 20 to 40 inches of rain falls annually in Lithuania.

The People and Their Work

The People. Many historians believe that the Lithuanians and Greeks are descended from the same early Aryans. These Aryans formerly lived near the shores of the Caspian Sea.

Lithuanians are fair-skinned, fair-haired, and of graceful build. Their language, Lithuanian, is a branch of the Indo-European group of languages. The Letts, who live in Latvia, are related to the Lithuanians.

Hundreds of thousands of Lithuanians have been deported to Siberia by the Russian communists. But Lithuania has about the same number of people as before World War II, because many persons have been brought into Lithuania from other parts of Russia.

Because of this interchange of people, more than half the people of Lithuania cannot speak Lithuanian.

Way of Life. Most Lithuanians live on farms or in small towns. Much of their life is drab under communist control. But Lithuanians have several cheerful customs that help brighten their lives. Christmas always has been a special festival, and Lithuanians celebrate it with a feast on Christmas Eve. Another Lithuanian festival is the feast of *Vainikas* in July. It is a midsummer festival, when the young people go to the forests to gather flowers to make wreaths. At the fall harvest festival, farmers hold open house for the harvesters.

Cities. Vilnius (Vilna, pop. 235,000) is the capital of Lithuania. Kaunas (pop. 214,000) is an important industrial city, and Klaipėda (Memel, pop. 89,000) is the chief seaport. Other important cities, together with their populations, include Šiauliai (60,000); Panevėžys (37,000); Ukmergė (19,800); Tauragė (18,600); Alytus (16,000); Marijampolė (15,000); and Vilkaviškis (14,000). See KAUNAS; MEMEL; VILNIUS.

Agriculture. About half of Lithuania is covered by farms. The main crops are potatoes, rye, oats, barley, wheat, and flax. Pastures take up one fifth of all the land. Stock raising and dairy farming are important.

After World War II, the farm land first was divided by the communists and later was collectivized. About nine out of ten of Lithuania's farms are part of collective farms. More than 120 machine-tractor stations and 290 machine- and horse-hiring stations serve the farmers.

Forestry always has been an important industry in Lithuania. Forests of pine, fir, and birch trees cover one fifth of the country. Lumbermen float timber down the Nemunas River to Memel, where much of it is made into paper and used for other products.

Manufacturing. The communists have set up many factories in Lithuania. They claim that manufacturing accounts for about three fifths of the country's total production. This is very different from 1940, when industry made up only one tenth of Lithuania's output. Factories produce agricultural and forest products, machinery, and electrical motors and appliances.

Trade. Before World War II, Lithuania's best customers were Germany and Great Britain. Since Lithuania was annexed to Russia, most of its trade has been with other parts of Russia.

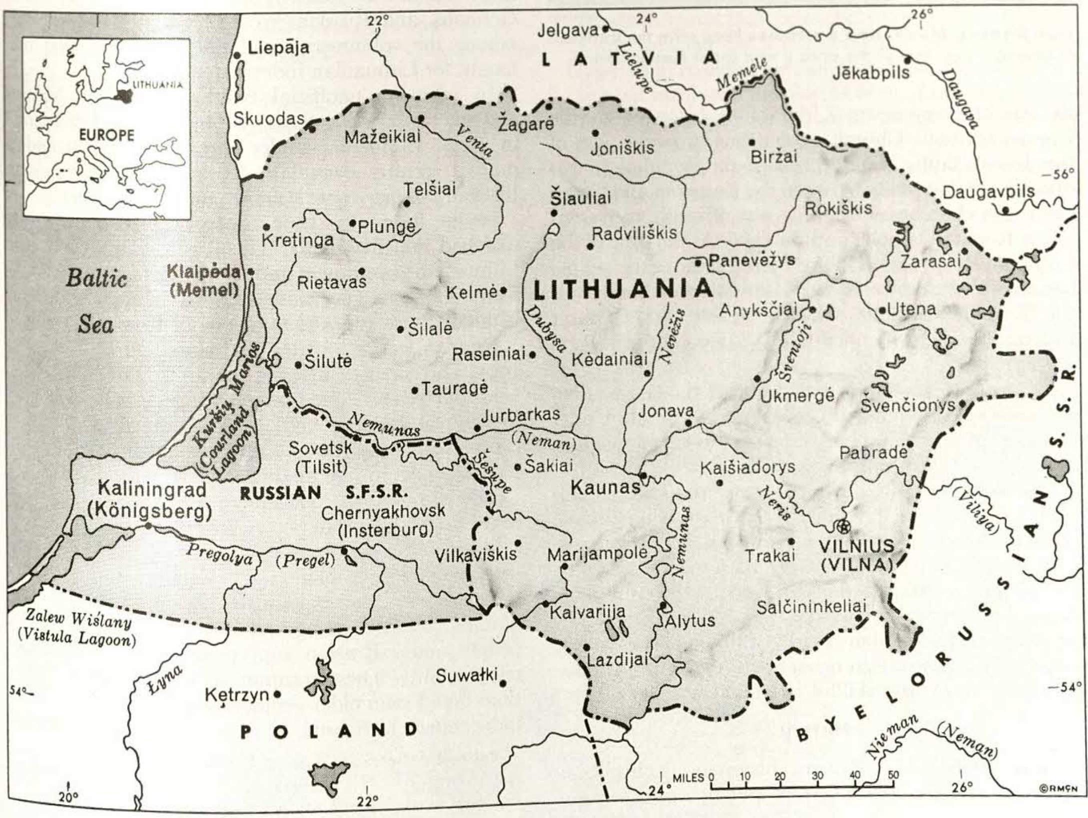
Transportation and Communication. Lithuania has about 1,700 miles of railways. Boats can navigate on about 125 miles of Lithuania's rivers. The Nemunas is open to shipping about 270 days a year. One of the largest airports of Russia is in Vilnius.

Telephone and telegraph lines link the main cities. Kaunas has a powerful radio station.

Social and Cultural Achievements

Education. Lithuania provided many schools for its people, as soon as it gained independence after World War I. Education was free, and all children were required by law to attend school. Since 1944, the communists have directed all education. There are eleven institutions of higher learning in Lithuania, and more than 4,000 primary and secondary schools.

Religion. Before the communists seized Lithuania,



Sovfoto

Folk Dances, Music, and Costumes keep alive the traditions of Lithuania even though the area is now under Russian control.

six out of every seven Lithuanians belonged to the Roman Catholic Church. About one in twelve was of the Jewish faith, and the rest of the population was divided about equally between the Lutheran and Greek Orthodox churches. Lithuania was officially converted to the Roman Catholic faith in 1386. At the time of the Lutheran Reformation in the 1500's, some of the people became Protestants. Most Lithuanians returned to the Roman Catholic Church during the Counter Reformation, which ended in 1648 (see Counter Reformation).

Most of the Jews were killed during the German occupation of Lithuania during World War II. Under Russian rule, there has been an effort to forbid religious services and Christian practices.

The Arts. For hundreds of years, the Lithuanians have preserved their folk tales, customs, and artistic skills by handing them down from one family to the next. Some Lithuanian tales date back to the days when the people worshiped the sun and the morning star. Adam Mickiewicz (1798-1855), a poet, is considered the best-known Lithuanian writer. Lithuania has many songs, called *dainos*, that never have been written down. Lithuanians are also skillful in wood carving.

History

Early Years. The Roman historian Tacitus (A.D. 50-120) made the first historical mention of the Lithuanians. Tacitus praised their methods of farming.

There is no definite history of Lithuania until the 1100's, when the Lithuanians were fighting their Russian neighbors. The first great ruler of Lithuania was Mindaugas (1236-1263), who united the various tribes into one nation. After his death, civil war raged for 20 years. Beginning with another ruler, Gediminas (1316-c.1341), Lithuania expanded in the 1300's until it covered land from the Baltic to the Black Sea.

In 1386, Grand Duke Ladislas Jagello (1350-1434) married the Polish queen Jadwiga. Jagello unofficially united Lithuania with Poland. The Teutonic Knights declared war on Poland to break up this union. Under the Lithuanian grand duke, Vytautas the Great (1392-1430), the Knights were defeated near Tannenberg, Poland, in 1410. In 1569, the union of Lithuania and Poland became official. The two countries had a common ruler, but remained separate political units. By 1795, when Poland was partitioned for the third time, Lithuania and Poland ceased to exist as countries. Part of the land was Prussian, and the rest was Russian. The Russian czars wanted to "Russianize" the Lithuanians, so they forbade them to write in their native language. But the Lithuanians kept their culture alive through nonwritten arts such as painting. See Poland (History); Teutonic Knights.

Independence. Lithuania was under German occupation at the time of the Russian Revolution in 1917. Nevertheless, Lithuania declared its independence on February 16, 1918. Lithuania became a democracy with a president and a parliament. The first president was Antanas Smetona (1874-1944). After World War I, large estates that formerly had been owned by Poles, Germans, and Russians were broken up and divided among the volunteers and landless farmers who had fought for Lithuanian independence.

In 1920, an unofficial Polish force seized Vilnius and the surrounding territory. Germany seized Memel in 1939. Lithuania, under threat of war, signed a mutual security pact with Russia in October, 1939. Russian military bases were set up in Lithuania.

Soviet Rule. In June, 1940, the Russian army marched into Lithuania. The Russians overthrew the Lithuanian government and set up a communist government. This new government staged fake elections, and Lithuania was annexed as a state of Russia.

German troops invaded and occupied Lithuania in 1941. The Nazis treated the country harshly during the next four years. They sent many workers to Germany to work as laborers and in war industries. After the communists returned to Lithuania in 1944 and 1945, Lithuania again was made a state of Russia.

The communists made many changes in Lithuania in the 1950's. Russian Secret Police and the Red Army shut Lithuania off from other nations. The communists tried to stamp out religion. They stepped up industrial production at the expense of agriculture. The communists collectivized agriculture. They also put young people under Russian supervision in many posts of responsibility. These communists follow Russian directions better than older people, who remember life in an independent Lithuania.

Francis J. Bowman

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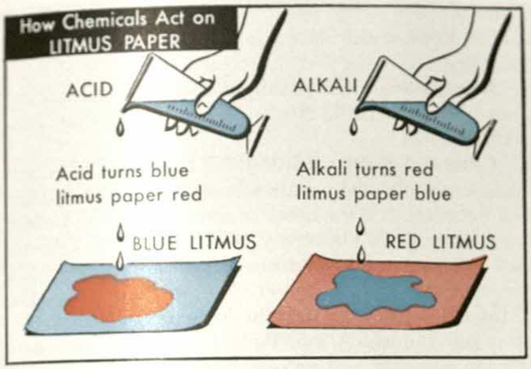

How Chemicals Act on LITMUS PAPER
ACID
ALKALI
Acid turns blue litmus paper red
Alkali turns red litmus paper blue
BLUE LITMUS
RED LITMUS

LITMUS is a dye made from certain plants called *lichens*. Chemists use litmus to detect the presence of acids and alkalies, or as an *indicator*. Acids turn blue litmus red; alkalies, on the other hand, turn red litmus blue or deep violet.

Litmus is used either as a solution or in the form of red or blue test papers. When a chemist neutralizes an acid solution, he first adds the litmus. Then he adds alkali until the red of the litmus changes to violet. One more drop turns it blue. Test papers show that a solution is neutral when moistening them changes neither the red nor the blue. Blue litmus paper is also used to some extent in testing to find the acidity or alkalinity of different soils. George L. Bush

See also Acid; Alkali.

LITTLE AMERICA. See Antarctica (Early Exploration).

LITTLE BEAR. See Big and Little Dippers.

LITTLE BIG HORN, BATTLE OF. See Crazy Horse; Custer, George A.

LITTLE BOY BLUE. See Field, Eugene.

LITTLE BROWN CHURCH. See Iowa (Interesting Places to Visit).

LITTLE CHIEF HARE. See Pika.

LITTLE CHURCH AROUND THE CORNER. See New York City (Architecture).

LITTLE CORPORAL. See Napoleon I.

LITTLE DIPPER. See Big and Little Dippers.

LITTLE EGYPT. See Illinois (Land Regions).

LITTLE ENTENTE, *ahn TAHNT*, was a political, economic, and military alliance between Czechoslovakia, Romania, and Yugoslavia. It was formed in 1920 and 1921 to guard against the activities of Germany, Austria, Hungary, and Italy. Eduard Beneš, Foreign Minister of Czechoslovakia, took the lead in proposing the alliance. In 1933, the nations of the Little Entente signed a second treaty setting up a permanent council and secretariat for the alliance.

The Little Entente was active until Adolf Hitler rose to power in 1933. But it lacked the strength to prevent the rearmament of Austria and Hungary in 1935, and of Germany in 1936; the union of Germany with Austria (called the *Anschluss*) in 1938; and the German occupation of parts of Czechoslovakia in 1938. Norman D. Palmer

LITTLE FLOWER OF JESUS. See Thérèse of Lisieux, Saint.

LITTLE GIANT. See Douglas, Stephen Arnold.

LITTLE JOHN, one of Robin Hood's followers, first met Robin Hood on a footbridge (see Robin Hood). Neither would retreat. They fell to blows, and John knocked Robin into the water. Robin Hood blew his horn, and his men came and prepared to duck the stranger in the stream. However, Robin Hood interfered and invited John to join his band. John was over seven feet tall, and Will Stutely, one of the band, named him *Little John* in jest. Knox Wilson

LITTLE LEAGUE BASEBALL is an organization of baseball teams for boys 12 years old and younger. Little Leagues use a diamond two thirds the size of a regulation baseball diamond, and games last six innings instead of nine. The players wear rubber-cleated shoes and use bats no longer than 33 inches. The ball weighs 5 to 5¼ ounces. The batter wears a protective helmet.

Each Little League can have only from four to six teams. A team can have from 12 to 15 players. The teams play at least 15 games a season to determine the

Little League Baseball offers boys up to 12 years of age the chance to enjoy organized competition and to use regular baseball equipment. Little League coaches teach the players the fine points of pitching, catching, and playing other positions.

A. Devaney; *St. Louis Post Dispatch;* Black Star

league champion. Winning teams also compete in regional championships.

Each summer, four regional championship teams from the United States, and one each from Europe, the Pacific, Latin America, and Canada compete in a Little League World Series at Williamsport, Pa.

Little League baseball was organized in 1939 by Bert and George Bebble and Carl Stotz of Williamsport. There are more than 25,000 teams in about 5,000 leagues in the United States, Canada, Panama, Mexico, Puerto Rico, Venezuela, Guam, the Philippines, Japan, Germany, France, Italy, Great Britain, and Saudi Arabia. More than 600,000 boys play Little League baseball.

Beverly J. Gray

LITTLE LORD FAUNTLEROY. See Burnett, Frances Eliza Hodgson.

LITTLE MISSOURI RIVER. See North Dakota (Rivers and Lakes).

LITTLE NORWAY. See Wisconsin (Interesting Places to Visit).

LITTLE ROCK, Ark. (pop. 107,813; alt. 300 ft.), is the capital, largest city, and chief trading and transportation center of the state. It is nicknamed *the City of Roses* because of the many roses raised there.

Location and Description. Little Rock lies near the center of Arkansas, across the Arkansas River from North Little Rock. These two cities and their suburbs make up the 781-square-mile Little Rock metropolitan area. For location, see Arkansas (color map).

Many buildings were erected in the residential and business sections during the 1950's. An entire new 600-acre industrial district developed two miles southwest of the city. The Strategic Air Command's Little Rock Air Force Base is nearby.

Industry. Little Rock serves as the wholesale trading center of the state, with about 400 outlets. The city has more than 200 manufacturing plants that make such products as chemicals, clothing, electronic equipment, furniture and other wood products, and light bulbs. Little Rock is the state's principal market for cotton and rice.

Little Rock, Ark., *foreground,* **and North Little Rock lie on opposite sides of the Arkansas River in the center of the state.**

Phelps, Arkansas Publicity & Parks Commission

Transportation. Three railroads and several truck and bus lines serve Little Rock. Five airlines operate from Adams Field.

Cultural Activities. Little Rock has about a hundred public schools, and a state school for the deaf and one for the blind. It is the home of Philander Smith College and Little Rock University. The University of Arkansas' graduate center, industrial research and extension center, and medical center also are in the city. The Museum of Fine Arts and the Museum of Natural History stand in MacArthur Park. Little Rock has a symphony orchestra and an opera organization.

Recreation. Little Rock has six city parks, a zoo, picnic grounds, playgrounds, golf courses, swimming pools, and a stadium. The annual Arkansas Livestock Show takes place in Little Rock in autumn.

Government. Little Rock became the capital of Arkansas Territory in 1821. It has served as the state capital since Arkansas joined the Union in 1836. The territorial Capitol, the old state Capitol, and the new state Capitol (built in 1915) make Little Rock the only city in the country with three Capitols. Little Rock has a council-manager government, and also serves as the seat of Pulaski County.

History. The French explorer Bernard de la Harpe, who explored the Arkansas River in 1722, named the river bluff *La Petite Roch (The Little Rock).* A land speculator, William Russell, staked out a townsite in 1820 that became incorporated as a city in 1831. During the Civil War, Little Rock served as a center for Confederate troops and supplies. Northern troops captured it in 1863, and held it until the end of the war. In 1957, Governor Orval E. Faubus attracted world-wide attention when he ordered the Arkansas National Guard to prevent desegregation at Little Rock's Central High School (see Arkansas [History]).

Walter L. Brown

LITTLE ROCK UNIVERSITY is a privately controlled coeducational school in Little Rock, Ark. Courses in liberal arts, business, and education lead to B.A. and B.S. degrees. The university was founded in 1927. For enrollment, see Universities (table).

LITTLE RUSSIAN. See Ruthenian.

LITTLE SISTERS OF THE POOR is a religious congregation of the Roman Catholic Church whose purpose is the spiritual and worldly care of the aged poor. It was founded in 1839 at St. Servan, France, by the Abbé Augustin Le Pailleur, along with Jeanne Jugan, Marie Jamet, and Virginie Trédaniel. Those cared for by the congregation live in homes that depend on charity. The nuns operate the homes and provide for necessities. The Little Sisters of the Poor have more than 300 homes in 27 countries, including the United States and Canada. The mother house is at La Tour St. Joseph in St. Pern, Ille-et-Vilaine, France.

Fulton J. Sheen

LITTLE THEATER is any small theater, but usually one in which amateur actors perform. The leading early little theaters include André Antoine's experimental theater in Paris, the Abbey Theatre in Dublin, and the Independent Theatre in London.

In the United States, the little theater movement developed after Maurice Browne founded the Chicago Little Theater in 1911. The best-known little theaters

Kenneth Helbron

Student Actors Rehearse a Scene for a Little Theater Production.

included the Provincetown Players and the Washington Square Players. The Washington Square Players later became The Theater Guild. Most large American communities have little theaters. The best-known include the Cleveland Playhouse, the Pasadena Playhouse, and the Pittsburgh Playhouse. Richard Moody

See also Drama (The Little Theater movement).

LITTLE TURTLE. See Indian Wars (Other Midwestern Conflicts); Indiana (Famous Hoosiers).

LITTORAL. See World (Natural Factors).

LITURGY, *LIT ur jih,* is a form of public worship in Christian churches. It usually means the celebration of the Eucharist. It is called the *Divine Liturgy* in the Eastern Orthodox Church and the *Mass* in the Roman Catholic Church. The name liturgy is older than the Christian religion. It comes from the Greek, and means *a public service.* In New Testament times it came to mean a public form of divine worship. The best-known liturgies are the Latin, represented by the Roman Catholic Mass, and the Vernacular, represented by the forms used in the Church of England and in the Protestant Episcopal Church. The Byzantine liturgy of the Eastern Orthodox Church is celebrated in many different languages. Fulton J. Sheen and Mervin Monroe Deems

See also Communion; Mass.

LITVINOV, *lit VEE nuf,* **MAXIM MAXIMOVICH** (1876-1951), a Soviet diplomat, joined the Soviet foreign service in 1918 and became commissar for foreign affairs in 1930. His negotiations with President Franklin D. Roosevelt led to the recognition of Russia by the United States in 1933. Litvinov also led Russia to become a member of the League of Nations. He served as Soviet envoy in Washington from 1941 to 1943. Litvinov was born in Bialystok, Poland, then a part of Russia. Albert Parry

LIU SHAO-CHI, *lyoh shoh jee* (1898-   ), succeeded Mao Tse-tung as chairman of the People's Republic of China (Communist China) in 1959. He is considered the top theorist of the Chinese Communist party, and serves on the politburo. He helped Mao organize the communist armies that overran China in 1949. He became chairman of the parliament's standing committee. Liu was born in Hunan of a poor farm family. In the early 1920's, he studied in Moscow, then returned to China and entered the trade-union movement.

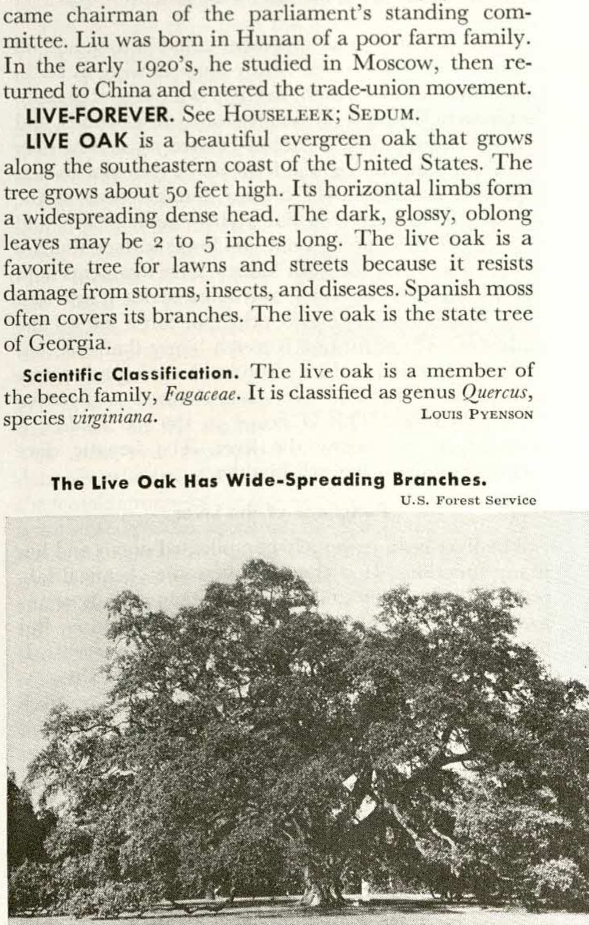
LIVE-FOREVER. See Houseleek; Sedum.

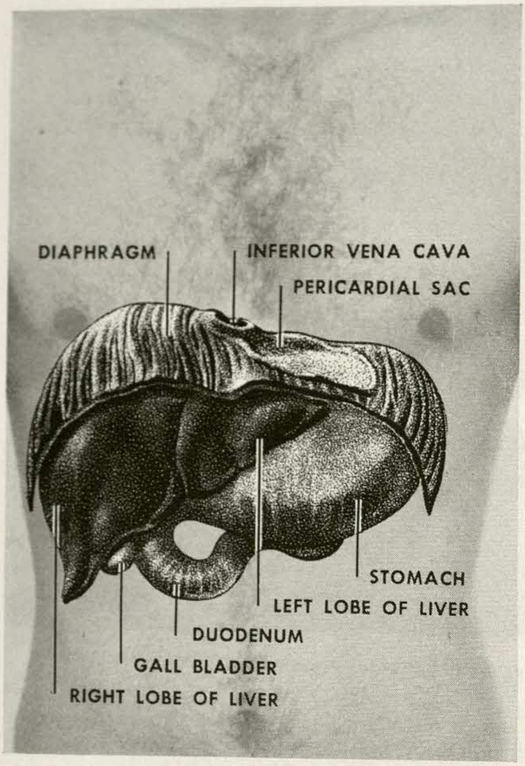
LIVE OAK is a beautiful evergreen oak that grows along the southeastern coast of the United States. The tree grows about 50 feet high. Its horizontal limbs form a widespreading dense head. The dark, glossy, oblong leaves may be 2 to 5 inches long. The live oak is a favorite tree for lawns and streets because it resists damage from storms, insects, and diseases. Spanish moss often covers its branches. The live oak is the state tree of Georgia.

Scientific Classification. The live oak is a member of the beech family, *Fagaceae.* It is classified as genus *Quercus,* species *virginiana.* Louis Pyenson

The Live Oak Has Wide-Spreading Branches.

U.S. Forest Service





The Liver is an important organ that lies toward the right side of the abdominal cavity, beneath the diaphragm.

LIVER is a large and important gland in man and all animals with backbones. Many animals without backbones have livers. In man, the liver is the largest glandular organ of the body. It weighs from 3 to 4 pounds, and is a soft, dark red or chocolate-colored mass. The liver lies mainly on the right side of the abdominal cavity. Its upper surface curves inward and fits close to the diaphragm. The liver is flat and irregular below, and thicker behind than in front. Its lower surface touches the intestines and the right kidney. Five ligaments hold the liver in place. Grooves, or fissures, divide it into four lobes or sections. The two principal lobes are on the underside. The right one is much larger than the left.

Blood is carried to the liver through the hepatic artery and portal vein. The liver manufactures a digestive fluid called *bile.* This is stored in the *gall bladder,* a pear-shaped sac below the liver. The hepatic duct carries the bile to the gall bladder.

Functions of the Liver

The liver is an extremely complicated organ and has many functions. It is the most versatile chemical laboratory in the body and is a vital organ. Death occurs in 8 to 24 hours after the liver stops functioning. But the liver has a remarkable power to grow new cells. If it did not, liver diseases would cause more deaths.

Glycogen. The liver receives blood from the stomach and intestines through the portal vein. In the liver, this vein divides into a network of capillaries. As it passes through the liver, the blood is freed of its waste matter and poisons. The liver cells also remove some sugar from the blood and change it into a kind of animal starch called *glycogen.* Liver cells store glycogen to be given out again as sugar when the blood needs it.

Vitamins, Minerals, and Proteins. The liver stores vitamins, minerals, and proteins. It stores vitamins A and D and those of the B-complex group. It contains vitamin B_{12}, required for the normal production of the red blood cells and the prevention of pernicious anemia (see Anemia [Deficiency Anemia]). It stores iron needed to produce hemoglobin, the red pigment of the blood (see Iron). The liver makes many blood proteins. The chief ones are albumin, globulin, and fibrinogen. *Albumin* decreases the ability of the blood to flow through capillary walls and tends to prevent edema (see Edema). The globulin part of blood plasma contains immune bodies that provide resistance to disease. When the liver does not produce enough globulin, a person has a tendency to bleed and lacks resistance to infectious disease. *Fibrinogen* makes the blood clot.

Bile. Another function of the liver is to manufacture bile. This thick, greenish or yellow fluid is poured into the small intestine, where it aids digestion.

Urea. One of the most important functions of the liver is to form urea, a nitrogen substance derived from proteins in food. Digestion breaks down the protein substances in food and the blood stream carries them to the liver. Here urea forms. The liver releases urea into the blood stream, which carries it to the kidneys. The kidneys excrete the urea and it leaves the body in urine.

Diseases of the Liver

Because the liver destroys various parasites and poisons brought into the body, it often becomes diseased itself. That is why persons who have suffered from malaria, dysentery, and other germ diseases, or have been poisoned by chemicals may have a liver disease.

Jaundice. When the liver is damaged so that it does not excrete bile pigment, a condition called *jaundice* occurs. Bile pigment, carried by the blood, turns the skin and other tissues yellow, and food cannot be completely digested. A person should call a physician as soon as jaundice appears.

Cirrhosis of the liver is another serious disease. In this condition, the connective tissue first thickens, then shrinks, causing the liver cells to waste away. The whole liver may become hard, yellow, gritty, lumpy, and shriveled. Alcohol irritates liver tissue, and one form of cirrhosis affects people who drink too much alcohol. The disease also may result from certain infections, from poisons, or from a diet that contains too much fat and not enough protein. A lack of B-complex vitamins also makes a person likely to get cirrhosis.

Infections of the liver often cause the organ to become abscessed. One of the most serious kinds of abscesses is that resulting from amebic dysentery, a bowel infection (see Dysentery). Certain drugs and chemicals are harmful to the liver. These include chloroform, carbon tetrachloride (an ingredient of some cleaning fluids), phosphorus, and arsenic. Andrew Conway Ivy

Related Articles. See the Trans-Vision three-dimensional color picture with Human Body. See also the following articles:

Anticoagulant
Bile
Cirrhosis
Gall Bladder
Glycogen
Hepatitis
Jaundice
Urea

LIVERLEAF. See Hepatica.

The Port of Liverpool, near the mouth of the River Mersey, is Great Britain's second largest seaport, in terms of cargo handled. Many transatlantic passenger ships dock at Liverpool. Over seven miles of docks line the River Mersey.

British Travel Assn.

LIVERPOOL (pop. 773,700) is the third largest city in England. It lies two miles from the mouth of the River Mersey and 200 miles northwest of London. For location, see Great Britain (color map). Liverpool is the third largest seaport in the world. Only New York City and London are larger. The port of Liverpool was built at great cost, because the city has no natural harbor. Dredges are constantly at work deepening the river by scooping mud from the river bed. Special docks must be provided to protect vessels against the exceptionally high tides. An automobile tunnel, called Queensway, was opened under the Mersey in 1934.

Liverpool is the home of Liverpool University. The city is a religious center, and has two modern cathedrals, one Anglican and the other Roman Catholic. The latter is one of the largest church buildings in the world. St. George's Hall, the most famous of Liverpool's many fine buildings, was built from the profits of the city's overseas trade. It is now used for civic assemblies.

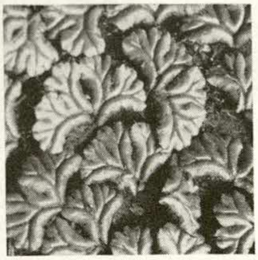
Trade. Visitors enjoy watching the procession of ships sailing inward and outward on the muddy River Mersey. These ships fly the flags of all nations. Inbound vessels carry large stocks of raw cotton, much of it from the United States. Some outbound ships take finished cotton products to all parts of the world. There has been trade between Liverpool and West Africa for several centuries. Imports from West Africa include nuts, oil, manganese, cotton, and timber. Strange diseases, such as sleeping sickness and various tropical fevers, are studied and treated by medical specialists at Liverpool's School of Tropical Medicine.

History. Liverpool was founded early in the 1200's and received its first charter in 1229. It became an important trading city after the settlement of America, and was a center of the slave trade. Its greatest growth took place after the Industrial Revolution. The rise of the cotton industry made Liverpool a great port. The canal joining Liverpool to the cotton center of Manchester greatly increased its importance. German bombers heavily damaged the docks and buildings of Liverpool during World War II. Frederick G. Marcham

LIVERPOOL RANGE. See Australia (Location, Size, and Surface Features).

LIVERWORT, *LIHV ur WURT.* Liverworts are small green plants closely related to the mosses. They are found in all parts of the world, growing in damp shady places, on rocks, and bark, and sometimes in water. The lower liverworts are shaped like minute leaves of seed plants with many lobes. The main body of the plant, which looks like a leaf, is called the *thallus.* Liverworts get their name because the thallus is often shaped like the human liver. Superstitious persons once believed that they cured liver diseases.

Tiny rootlets grow from the underside of the thallus. These structures are called *rhizoids.* They absorb water and the minerals that the liverwort needs for nourishment. The rootlets also hold the plant to the rocks and trees on which it grows.



L. W. Brownell

Each Liverwort Plant looks like a small leaf.

Liverworts produce new plants in several different ways. One way is important because it includes two separate phases, or generations. The thallus is the *sexual* generation. It is called the *gametophyte.* Male and female sexual structures grow on the thallus. The male structures produce sex cells called *antherozoids.* The cells produced by the female structures are the *eggs.* Later the antherozoids swim through the moisture on the plant until they reach the eggs in the female structure. An egg is fertilized when the two cells join each other.

The fertilized egg grows into a tiny new structure, the *sporophyte.* This is the *nonsexual* generation. It lives and feeds on the larger liverwort thallus, and soon is ready to produce *spores.*

The liverworts are among the lowest plants that have this two-stage type of reproduction.

Scientific Classification. Liverworts make up the class *Hepaticae.* They are one of the two main classes in the division *Bryophyta.* Rolla M. Tryon

See also Bryophyte; Moss.

LIVESTOCK

Gerald R. Massie

The Livestock Industry furnishes much of the food and clothing that people use. Scientific breeding methods have improved the many kinds of livestock raised in the United States and Canada, which range from riding horses, *above*, to poultry, *right.*

J. C. Allen & Son

Poultry, especially chickens, provide food in the form of eggs and meat either as fryers, broilers, roasters, or stewing hens.

Livestock Provide Clothing or material to make cloth, such as the wool that is sheared from sheep.

Marketing Livestock when prices give the farmer the best profit shows proper production planning.

United Press Int.

Omaha Chamber of Commerce

LIVESTOCK are domestic animals raised for their working ability or for their value as a source of food and other products. Kinds of livestock range from the familiar cattle, sheep, and hogs to such unusual animals as water buffaloes and reindeer. Farmers usually raise livestock on farms or ranches. But some people raise small livestock, such as chickens and rabbits, in their backyards. In some parts of the world, people keep herds of livestock on high mountains or on dry deserts.

Since prehistoric times, man has raised certain kinds of animals for the products and services they furnish. Some of these animals are raised primarily as draft, or work, animals. Others take people from one place to another. Still other animals furnish food, including meat, milk, butter, cheese, lard, and eggs. Many provide valuable by-products such as leather, hair, wool, fertilizer, and glue. They also provide tallow fat, which cannot be eaten. This tallow can be made into soaps, glycerin, leather dressing, candles, and other products. The hoofs and horns can be made into combs, handles for knives, canes, and umbrellas, and other useful articles. Various substances valuable in medicines are prepared from certain glands and other organs of animals. Among these substances are adrenalin, pancreatin, pepsin, and thyroid extract. Other by-products are used in feeding livestock. See MEAT PACKING (By-Products).

Soil and climate affect livestock production. The large populations of some countries and the limited amount of good land prevent the raising of livestock on a large scale. But there are few farms in the United States and Canada that do not have some livestock.

Kinds of Livestock

The animals raised in greatest numbers in the United States are beef and dairy cattle, hogs, sheep, chickens, and turkeys. Less numerous kinds include goats, some fur-bearing animals, ducks, and geese. Rabbits are raised for both fur and food.

Most European farmers raise the same kinds of farm animals as do farmers in the United States. But in other regions of the world the leading kinds of livestock are quite different. Reindeer are the most important domestic animals in the cold, barren lands at the extreme north of Europe. Camels largely take the place of horses as beasts of burden in the deserts of North Africa and parts of Asia. Over large areas of Asia and the East Indies, yaks, water buffalo, and other members of the cattle family are raised instead of the common domestic cow. In the high plateaus of South America the camel-like llama and alpaca are the principal animals used for meat and for the carrying of loads.

Livestock Care

Food. Animals need enough of the right kinds of feed at all seasons of the year. Animals, like human beings, require a proper diet, or *ration*. The ration should contain plenty of proteins, carbohydrates, fats, minerals, and vitamins in order that the animals may make their best growth and keep healthy. In summer, cattle, sheep, horses, and goats can get their feed from good permanent pastures or from fields of alfalfa, clover, and other forage crops. But in winter, there is little for them to eat except dry feed. Then the farmer must take extra care to keep his animals properly fed.

Livestock Shows and fairs encourage farmers to improve their breeds. Prize-winning cattle usually command top market prices.

The kinds of feed given to an animal may affect the quality of the carcass it produces. For example, if a hog is fed a ration containing large amounts of soybeans or peanuts, it will produce a carcass that is soft. But firm carcasses of high quality come from hogs that are given such feeds as corn, wheat, barley, and oats.

Dairy cows and mother animals nursing their young need feeds with plenty of proteins, carbohydrates, fats, and minerals in order to produce large quantities of milk. Laying hens need a rich ration and extra calcium for the shells of their eggs. Calcium is often supplied to poultry in crushed oyster shells or in some other form.

Shelter. Livestock need healthful, comfortable living quarters. Barns, stables, and poultry houses should be laid out so that they can be kept clean, dry, and sanitary. They should also provide light, freedom from drafts, and protection from harmful animals.

Some dairy cows spend much of their time indoors, especially in the colder regions. They must be carefully handled to get the most milk from them. Other animals, such as sheep and range cattle, may pass their whole lives outdoors, especially in mild and sheltered locations. But even the hardiest animals need to be provided with shelter of some sort where they can find some protection from storms. Newborn lambs, calves, and other animals usually require warmth and protection indoors if they are born during cold or stormy seasons.

Health. Animals suffer from many serious diseases. Some of these diseases cause the deaths of a large percentage of farm animals. Government agencies, including those of the states as well as the United States Department of Agriculture, have devoted millions of dollars to the study of animal diseases and to campaigns for stamping them out.

Farmers and veterinarians should inspect herds regularly for signs of sickness. Sometimes it is sufficient to keep sick animals in a place by themselves. At other times serious outbreaks of disease make it necessary to kill both the sick and the suspected animals. Certain animal diseases such as tick fever can be largely prevented by dipping the animals at regular intervals in an arsenical solution. This destroys the ticks that carry the disease. Some diseases can be prevented or made less severe by vaccinating the young animals. Blood tests and tests of other kinds make it possible for farmers and veterinarians to discover those animals in a herd that carry diseases that might spread to healthy animals. Various state agencies and officials of the Federal Food and Drug Administration also help prevent the spread of disease. They inspect meat and dairy products and the plants which produce them.

Livestock Breeding

Livestock Improvement. Man has changed the size, type, rate of growth, and other qualities of his domestic animals. He has done this by breeding and selecting the offspring of the particular animals best suited to his purposes. For example, instead of selling the superior animals, the farmer retains them in his herds and flocks to be used for breeding purposes. This is a form of *selective breeding*. The process of selection and improvement is still going on, so that livestock breeders of the future may expect to have breeds of animals better than any known at the present time. The recent advances in the science of genetics and animal breeding have also been used to put livestock breeding on a surer footing.

Animal breeders have three principal purposes in improving livestock. The first purpose is economy—to develop breeds which produce the greatest amount of products with the least expense for care and feed. The second purpose is to find breeds that can resist animal diseases, in order to cut down farmers' losses from this cause. The third purpose is to develop breeds of animals that can thrive under different conditions of climate.

No one breed of animal is best for all purposes. Horses of great strength make the best draft animals, but lighter, swifter horses are more desirable for riding. The cows that furnish the most milk do not furnish as much beef as the breeds that produce more flesh. For these reasons, animal breeders must decide what qualities they want

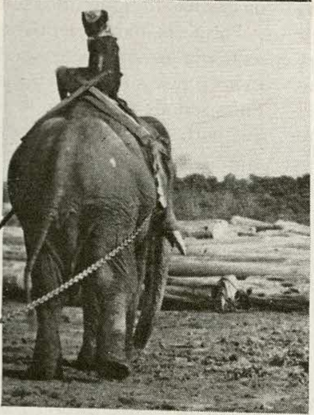
James Sawders

The Most Important Livestock in the North are hardy reindeer. Great herds live in the extreme north of Europe, Asia, and North America. Reindeer furnish meat, milk, clothing, and transportation.

United Nations

Camels take the place of horses as beasts of burden in the hot, dry deserts of North Africa and Asia.

Powerful Elephants do much heavy work in the dense forests of India, Burma, and other Asiatic countries.



Ewing Galloway

Matson Lines

Huge, Plodding Water Buffaloes are the most common livestock used as beasts of burden in southern Asia. Powerful Indian buffaloes can plow through mud that is knee deep. They make rice farming possible on a large scale.

in a particular breed, and breed the animals that show those qualities in the highest degree.

Livestock shows are held every year in many agricultural communities, at which prizes are awarded for the individuals which show the best characteristics of each breed in the highest degree. Such prize-winners are superior animals. They may be sold, usually at high prices, or retained in the herd for breeding purposes. In this way the breed is improved. It is not enough for the purchaser to know the animal's pedigree. He must also be sure that the animal itself is of correct type. If he is buying a milk cow, he will look for the typical characteristics of dairy cattle. What the dairy farmer wants is to buy or raise a cow that will give large quantities of milk, and that will bear calves which inherit this same quality. The farmer is interested in the cow's appearance because he knows that the best cows of that particular breed have certain distinctive characteristics.

Breeding Methods. Livestock raisers must breed animals that grow and fatten rapidly without a long period of costly feeding. Farmers depend upon agricultural bulletins and books on feeding and nutrition for much of this information, as well as upon their own past experience. There is a best time of year for breeding animals of each kind, though this varies according to the part of the country. Some farm animals can be bred only once a year, others twice a year, or even more often. Most young chicks are hatched at such a season that the pullets will be laying heavily in winter when eggs for the table are most scarce and costly. Breeding of sows should be planned so that the pigs will be born in spring or fall. Spring is the most usual time to have young animals born. The warm weather allows the farmer to use less expensive housing for the young animals. The young animals can be turned out to pasture, and require less care.

About half of all the young animals born are males, which are not used in the production of milk or eggs. This does no harm in a herd of beef cattle since the young males can be fattened as steers and sold for beef. But male calves of the dairy breeds do not fatten up equally well. Therefore, all except the few kept for breeding are usually sold for early slaughter as veal calves. In flocks of poultry kept chiefly for egg production, the young roosters may be sold early as fryers. Alfred B. Caine

Related Articles in World Book include:

Chief Kinds of Livestock

Cattle
Chicken
Duck
Hog
Horse
Poultry
Rabbit
Sheep
Turkey

Unclassified

Agriculture (Raising Animals)
Breeding
Disease (Diseases of Animals)
Farm Life (Raising Animals)
Feed, Livestock
Genetics
Veterinary Medicine

LIVING STANDARD. See STANDARD OF LIVING.

LIVING THINGS. See BIOLOGY; CELL; LIFE.

LIVINGSTON, PHILIP (1716-1778), a signer of the Declaration of Independence, gave generously of his fortune to help the American cause in the Revolutionary War. As an importer in New York City, Livingston, like his brother William, took an active part in civic affairs. He served as a delegate to the Stamp Act Congress in 1765, to the Continental Congress from 1774 to 1778, and to the New York Provincial Congress. Livingston was born in Albany, N.Y., and was graduated from Yale University. ROBERT J. TAYLOR

LIVINGSTON, ROBERT R. (1746-1813), an American statesman, helped draw up the Declaration of Independence. He was a member of the New York convention that ratified the U.S. Constitution, and he helped draft the New York state constitution. Livingston administered the oath of office to George Washington when he became the first President of the United States.

Culver

Robert Livingston

In 1775, Livingston served as a delegate to the Continental Congress. From 1777 to 1801, he was chancellor, or presiding judge, of the New York court of chancery. Livingston served as Minister to France from 1801 to 1804. While in France, he negotiated the Louisiana Purchase, which added a vast new territory to the United States. Later, Livingston gave Robert Fulton help in building the steamboat *Clermont*. This ship was named for Livingston's home in New York. Livingston was born in New York City, and studied at King's College, now Columbia University. In 1874, the state of New York presented a statue of Livingston to Statuary Hall. IAN C. C. GRAHAM

LIVINGSTON, WILLIAM (1723-1790), a signer of the U.S. Constitution, served as the first governor of New Jersey. His term began in 1776 and lasted the rest of his life. Livingston represented New Jersey at the First and Second Continental congresses. In 1776, he became commander of the New Jersey militia. Like his brother Philip, he gave generously of his time and fortune to help the cause of American independence. Livingston was born in Albany, N.Y., and was graduated from Yale University. KENNETH R. ROSSMAN

LIVINGSTON STATE COLLEGE is a coeducational state college at Livingston, Ala. Founded in 1835, it was a state teachers college until 1957, when it adopted its present name. Courses lead to B.A., B.S., and M.S. degrees. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LIVINGSTONE, DAVID. See STANLEY AND LIVINGSTONE.

LIVINGSTONE COLLEGE is a coeducational college at Salisbury, N.C. Founded in 1879, it is affiliated with the African Methodist Episcopal Zion Church. Livingstone's liberal arts division grants A.B. and B.S. degrees, and its Hood Theological Seminary offers B.D. and B.Th. degrees. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LIVORNO. See LEGHORN.

LIVRE, *LEE vuhr*, was an old French coin that differed in value according to the place of issue. Its name comes from the Latin *libra*, a pound that was used as money. The standard livre equaled four fifths of the Parisian livre. The livre was replaced in 1795 by the franc (see FRANC).

LIVY, *LIHV ih* (59 B.C.-A.D. 17), was one of the greatest Roman historians. His *Historiae ab Urbe Condita* (History from the Founding of the City) tells of Roman history from the founding of Rome until the death of Drusus in 9 B.C. He wrote this work in 142 books, but only 35 of them are still in existence today.

Livy, whose real name was Titus Livius, lived in Rome during the reign of Augustus. The emperor was his friend and patron. Livy spent more than 40 years working on his history. The work became famous during ancient times and was widely quoted. It was too long for most people to read, and became known chiefly through short summaries or abridgments. Many of these summaries have survived.

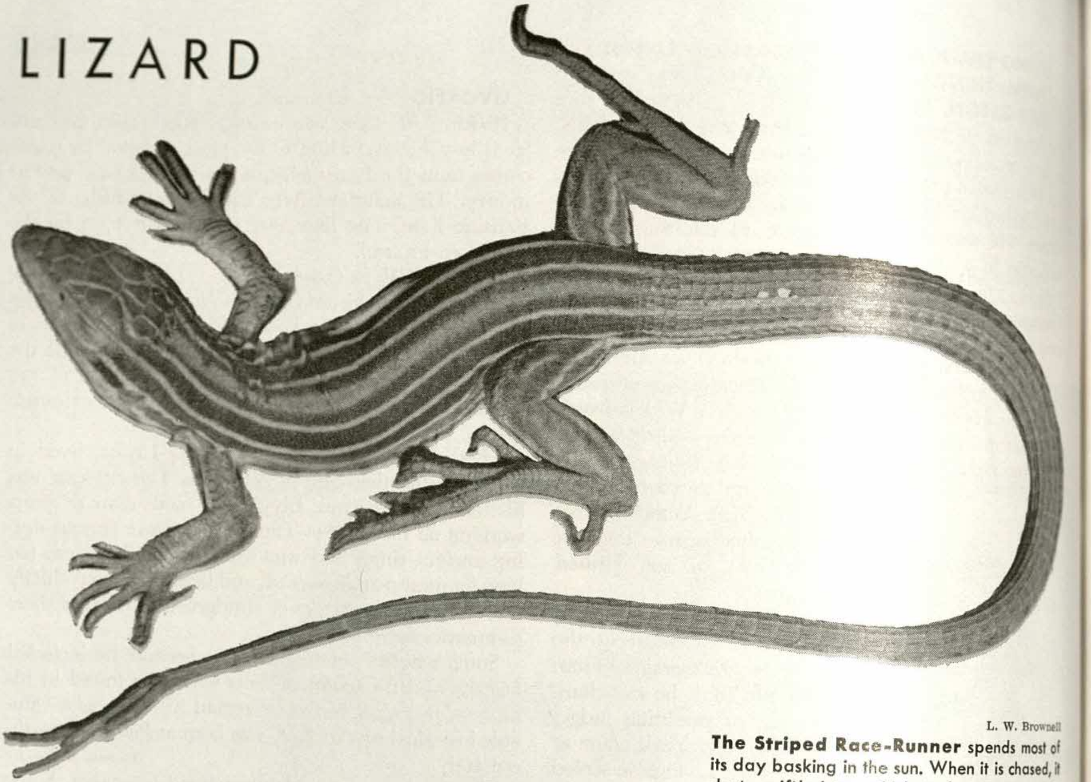
Some scholars condemned Livy because he included legends and miraculous events which he found in his sources. But most historians regard his work as a valuable historical source. Livy was born at Padua in northern Italy. THOMAS A. BRADY

LIZARD is a reptile closely related to snakes. Some lizards look almost like snakes, others resemble snakes with legs. Many large lizards look much like crocodiles. The lizards include animals of a variety of sizes, shapes, and colors. They have many different ways of moving about and of defending themselves. Scientists have identified more than 3,000 different species, or kinds, of lizards.

In the northeastern United States, many persons mistake lizards for salamanders. Few lizards live in this area, but there are many salamanders. The salamanders are commonly called "spring lizards" or "wood lizards." Many lizards live in the Southwest, but few salamanders do. The two groups look much alike, but they are not related. Both are cold-blooded animals. These animals cannot keep their bodies much warmer or cooler than their surroundings. But lizards have dry, scaly skin. Salamanders are amphibians related to frogs, and have moist skin with no scales. Lizards love to stay in the sun, and salamanders avoid sunlight. See COLD-BLOODED ANIMAL; SALAMANDER.

Where Lizards Live. Lizards live in many places throughout the world. Their cold blood forces them to live in regions where the soil is not frozen all the year, so they can go down into it to sleep through the winter. They thrive in the tropics and the warmer parts of the temperate zones. In deserts and other dry regions, lizards are more common than any other reptiles. When the desert becomes too hot for comfort, they lie in the shade or hide a short way below the surface of the sand to escape the fierce rays of the sun.

Sizes of Lizards. The smallest lizards naturalists know of measure only 3 inches in length. The largest are the gigantic East Indian lizards, known as the *dragons of Komodo*. These huge creatures grow to about 9 or 10 feet in length and weigh nearly 150 pounds. Their



L. W. Brownell

The Striped Race-Runner spends most of its day basking in the sun. When it is chased, it darts swiftly into a thicket of grass.

relatives, the *monitors,* live in India, Africa, and Australia. These active lizards reach the length of about 7 feet.

How Lizards Move. The most remarkable thing about lizards is the variety of ways the different kinds move about. They seem to have followed the motto "Try everything once" in developing ways and means of getting around. More than 60,000,000 years ago, huge lizards called *mosasaurs* swam in the sea. Even today, giant monitors sometimes swim from one island to another. Five-foot *iguanas* of the Galápagos Islands feed on algae. They gather the plants off the rocks at low tide. No present-day lizard can fly, but a small group in Asia and the East Indies sail from tree to tree like flying squirrels. These lizards are the so-called *flying dragons.* They can spread out a fold of skin along either side of their body by moving several long ribs. This extended fold of skin forms a sort of sail which the flying dragons can use to glide through the air.

Most lizards, however, live on the ground or in trees. Even on the ground, the lizards have many different ways of moving about. Many people in America know the swift little lizards that scamper over old fences and logs. Some *geckos,* lizards that spend much time in trees, have claws that they can draw in as a cat does. Their feet also have soft adhesive pads. The claws catch in rough surfaces such as bark, and the pads cling to smoother ones. A gecko can walk upside down across a plaster ceiling without trouble, and can even cling to a pane of glass. The Australian *fringed* lizard is one of several lizards that can run on only two feet. It speeds up by raising the front of its body and running on its hind legs. It balances itself with its tail.

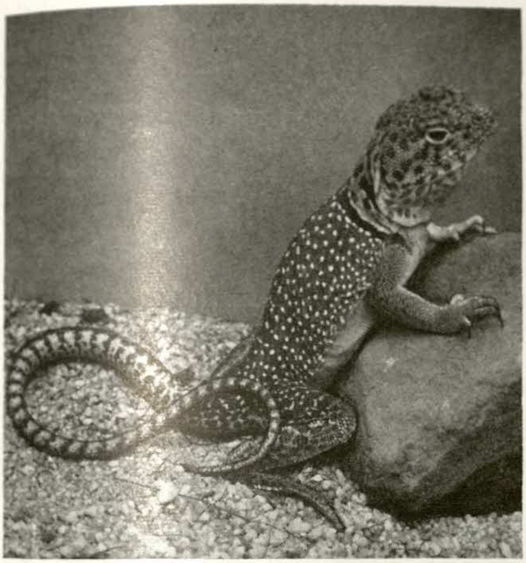
Many lizards that live on the ground can get along without any legs. Many kinds of the *skinks,* for example, have no legs. Other skinks have weak, nearly useless legs. The *glass snake* of the eastern United States is really a lizard without legs. It has well-developed eyelids, unlike those of a snake.

Defenses. The lizards defend themselves in a great variety of ways. Like the snakes, they usually bluff or play tricks. The glass snake has one of the most unusual methods of defense. This lizard's tail is twice as long as its body, and as brittle as an old twig. If an enemy seizes the lizard's tail, the animal pulls its body away from the tail and crawls to safety. Meanwhile, the tail keeps wriggling as though it were alive while the enemy struggles with it. The lizard does not seem to miss its tail, and in due time it grows a new one. Several other kinds of lizards can break off their tails and grow new ones to replace them.

Other common ways of bluffing include swelling up, hissing, and lashing the tail. The Australian *frilled* lizard ranks as one of the best bluffers. It rears on its hind legs, spreads an enormous frill out on each side of its neck, opens its mouth, and hisses. These antics make it look several times as big and fierce as it really is. A large frilled lizard measures about 32 inches long.

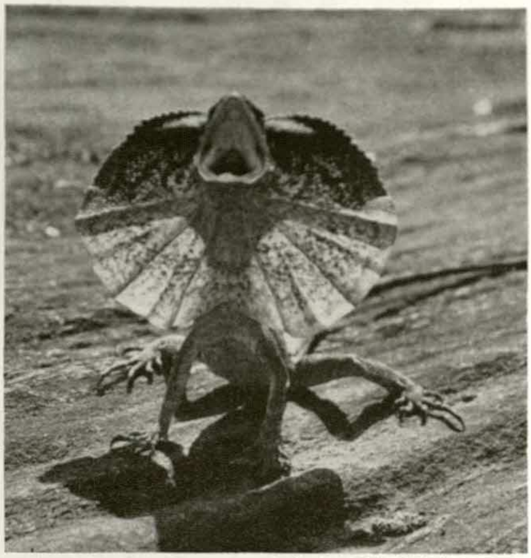
Some lizards are not such harmless fighters. The monitors and their relatives use their large jaws for biting. They use their tails as whips, and can strike a sharp blow. Unlike snakes, few lizards are poisonous. The only ones that have a dangerous bite are the two *Gila monsters,* one of Mexico, the other of the southwestern United States.

The *horned toads* have an unusual trick. They can squirt a fine stream of blood from their eyes for a distance of 3 feet. They will do this if a person or animal handles them roughly just after they have shed their old



L. W. Brownell

The Collared, or Ring-Necked, Lizard hops and jumps among rocks like a frog. When it is excited, it draws up its tiny forelegs and runs swiftly on its two strong hind legs.



Fritz Goro, *Life*, © 1955, Time Inc.

The Australian Frilled Lizard, opening his jaws with a hiss, unfolds his mantle to frighten intruders. The mantle may reach a diameter of nine inches on fully grown, three-foot males.

skin. The horned toad is not a real toad, but a lizard with a short tail. A set of sharp spikes on its head, and a number of spines on its back, give it added protection from its enemies.

The *chameleons* are famous for the way they can change color. Many other lizards have the same power. Many persons think that these changes help the animal to protect itself, but they are not always used in this way. Some lizards do rely on their colors to protect them. Desert lizards are usually light in hue, and those that dwell in the forest have darker colors. The different species have various combinations of green, red, gray, brown, white, and black.

Reproduction. Most lizards are *oviparous*, or lay eggs. But many others are *ovoviviparous*. The female keeps the egg inside her body until the young have fully developed, even nourishing them in some cases. Then the young are born alive, much like baby mammals. In these animals the egg has only a membrane for a shell. Unlike a mammal, the mother lizard does not nurse the young or take care of them in other ways after birth. In many species that lay eggs, the mother stands guard over the nest until the eggs hatch. Some mothers will go to much trouble to bring the eggs together if they become scattered.

Food. Lizards have less interesting eating habits than snakes. But, unlike snakes, some eat plants instead of animals. Hundreds of species eat mostly insects and small animals. Usually they do not limit their diet to any one thing. A few lizards, such as the chameleons, have a tongue that they can shoot out several inches beyond their snout, and capture insects on its mucus-coated tip. Others seize their victims in their mouths. These lizards swallow their prey as soon as it stops struggling.

Importance. Lizards are not of any great importance to man. The iguana and several smaller lizards are used for food in some parts of the world. A fine leather from lizard skin is made into fancy wallets, gloves, shoes, and handbags.

Scientific Classification. Lizards belong to the class *Reptilia*. They are members of the order *Squamata*. They form the suborder *Sauria*. CLIFFORD H. POPE

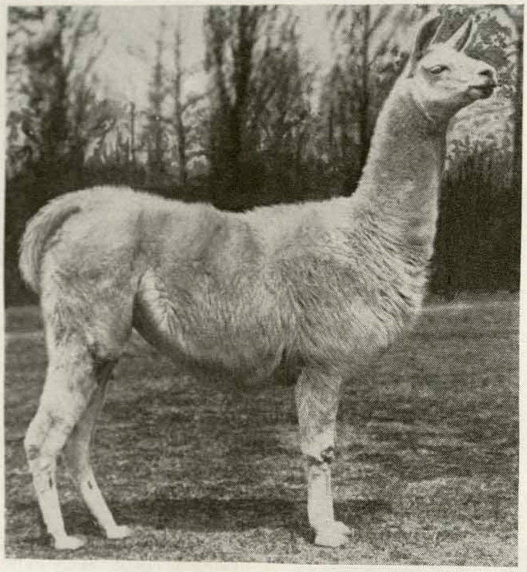
Related Articles in WORLD BOOK include:

Blindworm
Chameleon
Chuckwalla
Dragon of Komodo
Flying Dragon
Gecko
Gila Monster
Glass Snake
Horned Toad
Iguana
Monitor
Prehistoric Animal
Reptile
Snake
Swift
Teju

LJUBLJANA, *LYOO blyah nah* (pop. 138,211; alt. 984 ft.), the third largest city in Yugoslavia, lies in the northwestern part of the country. See YUGOSLAVIA (color map). It ranks as a major trading and industrial city. Manufactures include machinery and leather, metal, paper, and tobacco products. Ljubljana also serves as the capital and cultural center of Slovenia, one of the republics that make up Yugoslavia. The city has a university, several museums, and academies of science, art, music, and drama. GEORGE KISH

LLAMA, *LAH muh*, is the largest member of the camel family that lives in South America. The llama, like its smaller relative, the *alpaca*, is a domesticated animal that was probably bred from the wild *guanaco*. The llama has no hump, and is 4 or 5 feet tall at the shoulder. Its body is about 4 or 5 feet long. Its hair is thick, long, and coarse. It may be colored brown, buff, gray, white, or black. Males over $3\frac{1}{2}$ years of age are used for pack animals. The females are used for breeding and furs. The female llama bears one kid at a time.

The llama is most useful as a pack animal. Llamas can carry about 100 pounds each, and are sure-footed on the mountain trails. They can travel between 15 and 20 miles a day with a full load. Sometimes hundreds or thousands of llamas are used on an engineering project. Llamas can be very stubborn animals. If a llama feels



Wide World

The South American Llama is a distant relative of the camel. Llamas have been used as pack animals in South America for centuries. Like the camel, llamas have a mean, ugly disposition.

his pack is too heavy, or if he thinks he has worked hard enough for a while, he will lie down, with his front legs under him, and refuse to get up and move on. When the llama is angry or is attacked, it spits bad-smelling saliva into its enemy's face. When extremely angry, the llama may even vomit.

The llama is very useful to the Indians of Lima and Peru in many ways. These include transport, food, and clothing. The Indians eat the meat of the young animals. They use the hair of the llama to make garments, and they use its hide to make sandals. The llama is inexpensive to keep. It is a hardy animal and lives on low shrubs, lichens, and other plants that grow on high mountains. It can live for weeks without water. It gets its moisture from green plants.

Scientific Classification. The llama is a member of the family *Camelidae*. It is genus *Lama*, species *guanicoe*, subspecies *glama*.

VICTOR H. CAHALANE

See also ALPACA; CAMEL; GUANACO; RUMINANT.

LLANERO. See VENEZUELA (Way of Life).

LLANFAIRPWLLGWYNGYLLGOGERYCHWYRNDROBWLLLLANDYSILIOGOGOGOCH is the name of a village in Wales. The name means *Church of Saint Mary in a hollow of white hazel, near to a rapid whirlpool, and Saint Tysilio's Church of the red cave*. The original church was dedicated to the Celtic saint, St. Tysilio. The church was rededicated to the Virgin after the Roman Conquest, and both names were joined. DAVID WILLIAMS

LLANO ESTACADO. See TEXAS (Land Regions).

LLANOS, *LAH nohz*, meaning *level lands*, is most often used to mean a great treeless region in Venezuela and Colombia. This plain is known as the Orinoco Basin. The region covers about 300,000 square miles, an area larger than Texas. Heavy rains fall in the wet season, and the rivers flood the country. But after the rains, rich grasses grow to provide food for herds of cattle and horses and flocks of sheep. Hot winds scorch the grasses during part of the dry season, and the country becomes a desert. The animals then move where water can be found. Similar plains farther south, in Argentina, are called pampas. A high, level region in Texas and New Mexico is called the *Llano Estacado*, or *Staked Plains*. See also PAMPA; PLAIN.

ERNEST L. THURSTON

LLEWELLYN, RICHARD (1907?-), is the pen name of RICHARD DAVID LLEWELLYN LLOYD, a Welsh author. His novels include *How Green Was My Valley* (1940), *None But the Lonely Heart* (1943), and *Warden of the Smoke and Bells* (1958). Llewellyn was probably born in Pembrokeshire, Wales.

Culver

Harold Lloyd

LLOYD, HAROLD CLAYTON (1894-), an American motion-picture actor and producer, won fame for his comedy roles and for the horn-rimmed glasses he used as a trademark. Lloyd began his movie career at 19, as an "extra." In 1922, he starred in the first full-length comedy motion picture, *Grandma's Boy*. His other pictures include *Speedy*, *Why Worry?*, and *Girl Shy*. Lloyd was born in Burchard, Neb. He attended San Diego High School, where he was given many leading parts in plays. NARDI REEDER CAMPION

LLOYD, RICHARD DAVID LLEWELLYN. See LLEWELLYN, RICHARD.

LLOYD, SELWYN (1904-), a British statesman, became Secretary of State for Foreign Affairs in 1955. He entered parliament in 1945 as a member of the Conservative party. From 1951 to 1954, he served as minister of state, specializing in United Nations matters. He then served brief terms as minister of supply and as minister of defence. Lloyd was born in Liverpool. His full name is JOHN SELWYN BROOKE LLOYD. He was graduated from Cambridge University, and later he became a lawyer.

C. L. MOWAT

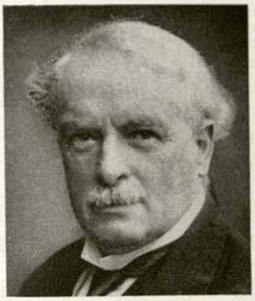
LLOYD GEORGE, DAVID (1863-1945), a British Liberal party leader, served as prime minister during the last half of World War I. He was also prominent in helping to draft the Versailles Peace Treaty. He led the British delegation at the conference which drew up the treaty that ended World War I. Lloyd George was active in British politics until his death.

Early Career. Lloyd George was born of Welsh parents in Manchester, England, on Jan. 17, 1863. His father died when he was a year old, and his mother took him to Llanystumdwy in Caernarvonshire, Wales. There he grew up in the home of his uncle, Richard Lloyd, a shoemaker and Baptist minister. He was reared in an atmosphere of hostility to the landed aristocracy and to the Church of England. He was apprenticed to a law firm at 16, and began the practice of law at 21.

Lloyd George early associated himself with the Liberal party. In 1890, on a platform of comprehensive social reform for Wales, he was elected to parliament from the Caernarvon Boroughs. He represented this constituency continuously for 55 years. He soon established a reputation as a "radical," and became widely known through his attacks on the government's policy in South Africa before and during the Boer War.

When the Liberals returned to power in 1905, Lloyd George became president of the Board of Trade. From 1908 to 1915, he served as Chancellor of the Exchequer. He sponsored the Old Age Pension Act of 1908 and the National Insurance Act of 1911. His "People's Budget" of 1909 introduced a tax on "unearned income" and greatly increased land and inheritance taxes. The Conservative House of Lords rejected this budget. This caused a constitutional crisis with the House of Commons which ended in victory for Lloyd George and his party. The power to veto financial legislation was taken away from the House of Lords.

Prime Minister. The coming of war in 1914 changed Lloyd George from a pacifist to a staunch supporter of the war against Germany. As Minister of Munitions in 1915, he ended shortages in ammunition. In July, 1916, he succeeded Lord Horatio Kitchener as Secretary of War, and in December, 1916, he replaced Herbert Asquith as Prime Minister of a coalition cabinet. Lloyd George is generally recognized as one of Britain's great war leaders. His leadership strengthened civilian morale. At the Paris Peace Conference in 1919, he mediated successfully between the idealism of President Woodrow Wilson and the severe peace terms sought by Premier Georges Clemenceau of France.



U&U

David Lloyd George

An easy electoral victory in December, 1918, kept Lloyd George and his coalition government in office. But he did not achieve the economic reconstruction he had promised. His Irish policy led to the formation of the Irish Free State, but cost him Conservative support. His pro-Greek policy failed. He resigned in 1922. Though only 59 years old, he never again held office. The Liberal party, divided in 1918 between his supporters and those of Lord Asquith, was reunited in 1923 but could not regain popular support. It soon became a weak third party.

Lloyd George tried unsuccessfully to make a comeback with an elaborate program of public works and agricultural reform. He visited Adolf Hitler at Berchtesgaden in 1936 and returned with praise for the German leader. But he soon became a severe critic of appeasement of Hitler. In 1945, shortly before his death, he was created Earl of Dwyfor. Alfred F. Havighurst

LLOYD'S is a famous insurance firm whose underwriters will issue a policy on almost anything that can be considered a fair insurance risk. Life insurance is one of the few types of insurance the firm does not issue. Singers who want their voices insured, dancers who want their feet insured, pianists who want their fingers insured—all look to Lloyd's of London. Motion-picture companies often insure their stars with Lloyd's against accident or illness. Three large losses in the 1900's, insured in part or completely at Lloyd's, included property destroyed in the San Francisco fire of 1906; the ocean liner *Titanic*, which sank in 1912; and the German airship *Hindenburg*, which burned in 1937.

Lloyd's

Lloyd's of London provides offices where thousands of brokers and underwriters insure almost any kind of risk or eventuality.

Lloyd's is an association of individual insurance underwriters. Its more than 4,600 members are grouped into about 300 syndicates. Lloyd's main business is marine insurance. It pioneered in many forms of insurance now considered commonplace. In April, 1958, the firm moved into new offices on Lime Street in London.

Lloyd's was founded in the coffee shop of Edward Lloyd about 1688. The shop was a favorite meeting place for shipowners and marine underwriters. Lloyd's publishes shipping information daily in the newspaper *Lloyd's List and Shipping Gazette*, but has no connection with *Lloyd's Register of Shipping*. The *Register* is a catalog which classifies merchant ships. Robert D. Patton

See also A 1; Insurance (History); Underwriting.

LOACH, BORNEO. See Fish (color picture, Tropical Fresh-Water Fishes).

LOADSTONE is a hard black stone that exhibits magnetic properties. It is made up of magnetite, which is ferro-ferric oxide (Fe_3O_4).

The loadstone was the first magnet of any kind. According to a legend, it was discovered in Asia Minor by a shepherd who noticed that certain black stones stuck to the iron end of his staff. Large amounts of this stone were found in an ancient country of Asia Minor called *Magnesia*. The stones came to be called *magnes lapis*, which means *magnesian stone*.

Many centuries later, Europeans discovered that an oblong piece of this stone would point to the north and south if it were hung by a string. They called it a "leading stone," or *loadstone.* Loadstone made compasses possible, and sailors no long had to steer by the stars. Today loadstones are mined in Siberia, the Island of Elba, and Arkansas. PALMER H. CRAIG

See also MAGNET AND MAGNETISM.

LOAM, *lohm,* is a soil that is between sandy soil and clay soil in texture. Loams are chiefly mixtures of sand, clay, and humus. They are considered among the most valuable soils in agriculture, and are easy to work. A typical loam soil feels smooth to the fingers and is somewhat sticky. A piece of clay feels very smooth and sticky. Any soil between loam and clay is called a *clay loam.* Soil between sand and loam is called *sandy loam. Silt loam* contains much silt. The fertile soil of the American Corn Belt is a silt loam. ERNEST E. WAHLSTROM

See also CLAY; HUMUS; SAND; SOIL.

LOAN. See BOND; INSURANCE (Life Insurance); LOAN COMPANY with its list of Related Articles.

LOAN COMPANY is an organization that lends money to individuals. There are many kinds of loan companies. Some were organized chiefly to combat the "loan sharks," or moneylenders who charge an illegally high rate of interest. The personal finance company has been the most common type of successful small-loan company. It has taken much business away from the "loan sharks".

The personal finance company is founded upon the Uniform Small Loan Law. This law was devised by the Russell Sage Foundation in 1916 (see SAGE FOUNDATION, RUSSELL). It was adopted by the states of New Jersey and Pennsylvania that same year, and has since been adopted by 25 other states. This law permits loan companies to lend money in small sums from $50 to $300, with or without security. These companies can charge as high as $3\frac{1}{2}$ per cent per month on unpaid balances, if they submit to being licensed and supervised by state banking authorities.

Many loan companies require only that the borrower's note be endorsed by two other acceptable parties. This is the method of the Morris Plan Bank (see MORRIS PLAN BANK). But the largest number of loans are usually made to families on the signature of both husband and wife. No comakers or endorsers are necessary. A chattel mortgage on the household goods or an assignment on wages is the most common security. Usually the loan is repaid in installments. This type of lending is similar to that formerly employed by the loan shark. But the borrower is protected by the state regulations under which the loan company operates. G. L. BACH

Related Articles in WORLD BOOK include:

Assignment
Banks and Banking (Loans)
Farm Credit
Finance Company
Interest
Mortgage
Pawnbroker
Savings and Loan Association
Usury

LOBACHEVSKY, NIKOLAI. See MATHEMATICS (Non-Euclidean Geometry; History).

LOBBY. See FOYER.

LOBBYING is an attempt to influence the vote of lawmakers. A person who tries to persuade legislators to vote in a particular way is known as a *lobbyist.* The words refers to the lobby or anteroom outside the room where legislators meet to vote on public bills.

The lobbyist may be a member of a group interested in a particular law. Or he may be the paid agent of a group that wants certain bills passed or defeated.

Lobbying may take place in school activities. For example, a student council may be asked to decide whether or not a newly formed school club shall be granted a charter. Members of the club may try to get the charter approved by convincing the members of the student council that the new organization has a worthwhile purpose. This would be a form of lobbying.

Properly used, lobbying can serve a useful purpose. It may be the best organized way in which citizens can make their wishes known to legislators. But not all lobbying is conducted along these lines. Sometimes the lobbyist may try to persuade a legislator by offering him favors or even money. When lobbying reaches this point it becomes bribery (see BRIBERY).

The United States Congress and about half of the states have enacted laws to prevent corruption in lobbying. The basic idea of these laws is to make lobbying practices public so that corrupt influences will be uncovered. The Federal Regulation of Lobbying Act of 1946 requires individuals and groups trying to influence legislation to register and submit quarterly reports to Congress. They must report their receipts, expenditures, and the bills in which they are interested.

Some constitutional questions may arise whenever laws regulate lobbying, because a citizen has the right of free speech. He also has the right under the Constitution to petition legislators. MURRAY S. STEDMAN, JR.

LOBE. See LUNG.

LOBELIA, *loh BE lih uh,* is the name of a group of flowers sometimes cultivated as ornamental plants. There are about 30 kinds in the United States. All lobelias produce a sharp, milky juice, and have flowers shaped like tubes flaring into two lips.

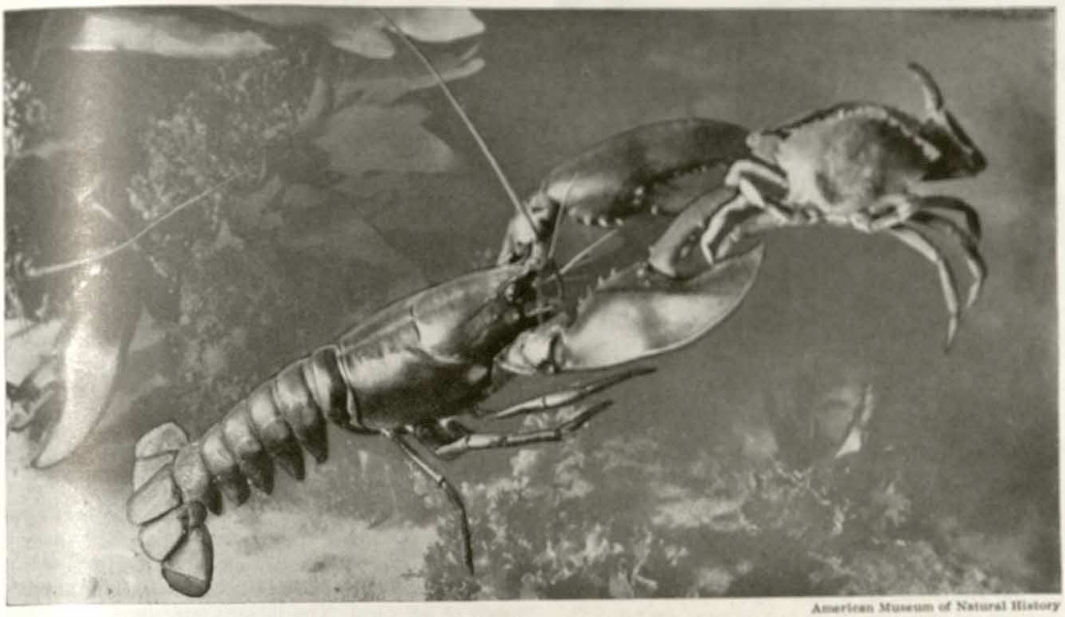
The *great lobelia* is a garden flower. It has many large blue flowers which bloom in the middle of the summer. It grows well with little care in moist soil. The *edging lobelia* is a low-growing annual which is often cultivated in window boxes. The *cardinal flower* is one of the best-known lobelias in the United States. Another kind of lobelia, called the *Indian tobacco,* has pale blue flowers and thin leaves with toothed edges. It gets its name because it is used by North American Indians in medicine. An extract from the plant is used to check convulsions, but it should only be taken by physician's direction because overdoses are fatal.

Scientific Classification. The lobelia belongs to the family *Lobeliaceae.* The great lobelia is genus *Lobelia,* species *siphilitica;* the edging lobelia is *L. erinus;* the cardinal flower is *L. cardinalis;* and the Indian tobacco is *L. inflata.* MARCUS MAXON

See also CARDINAL FLOWER.

LOBLOLLY. See PINE (Southern Hard Pines; picture).

LOBOTOMY, *lo BAHT oh mih,* is a surgical operation on the brain. Connections between one of the lobes of the brain and the rest of the brain are cut or interrupted in some way. The most common operation is the *bifrontal lobotomy,* in which the surgeon severs both frontal lobes. Surgeons perform lobotomies only on persons with serious mental illnesses. The operation is rare, because the original symptoms are often replaced by more serious personality disorders. See also BRAIN (The Cerebrum; picture, The Human Brain). FREDERIC A. GIBBS



American Museum of Natural History

A Large Lobster Capturing a Crab. Lobsters prey upon crabs, shrimps, and other lobsters smaller than themselves.

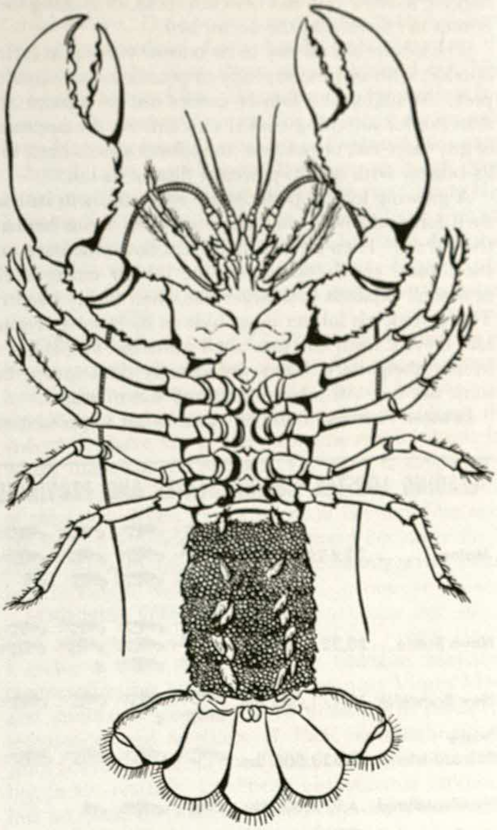
LOBSTER is a hard-shelled, joint-legged animal that lives on the ocean bottom. The delicious meat of the lobster makes it a prized delicacy. It is related to shrimps, crabs, and crayfish. Its narrow body usually measures between 1 and 2 feet long. It weighs from 2 to 35 pounds. Two large claws, almost as long as its body, reach out in front of the lobster, and its tail spreads out behind like a fan.

Body. The lobster has two pairs of *antennae*, or feelers, and five pairs of legs. Its two compound eyes are located on the ends of two thick, movable stalks. Its claws are on the front pair of legs. One of the claws is heavy, and has blunt teeth to crush the prey. The other claw is smaller, and has sharp teeth with which the lobster tears the prey to pieces. All lobsters do not have the heavy claw on the same side. Some are "right-handed," and others are "left-handed." The lobster swims backward, by means of quick forward flips of its tail.

Reproduction. The female lobster lays from 5,000 to 100,000 eggs at a time. It normally breeds every other year. Growing up from egg to adult is a long and dangerous period for young lobsters. Millions never grow old enough to reproduce. The mother lobster carries the unhatched eggs attached beneath its tail for 11 months. The mother may be caught and eaten with her eggs by some fish that feeds near the bottom of the sea.

The *larvae*, or immature lobsters, hatch in the spring. They measure about $\frac{1}{3}$-inch long. They leave their mothers and rise to the surface, where sea birds, fishes, squids, and other enemies may eat them. If they escape without being eaten, the larvae grow to about an inch long within a few months and sink back to the ocean floor where they develop into the young lobsters.

Habits. In the depths of the ocean, the young lobsters may be attacked even by other lobsters. They begin crawling toward shallower, safer waters near shore. Meanwhile, the lobsters feed on smaller forms of life, and sometimes eat each other. When fall comes, they move back into deeper waters. They begin adult life by



The Underside of a Female Lobster, showing how the eggs are carried under the tail. After being protected in this way for 11 months, the eggs hatch. The fan-shaped enlargement at the end of the tail is used in swimming backward.

Wide World

Lobster Fishermen use wooden traps, called *pots*, to catch this important sea food. They usually bait the traps with fish.

digging shallow burrows beneath rocks, or making their homes in crevices on the ocean bed.

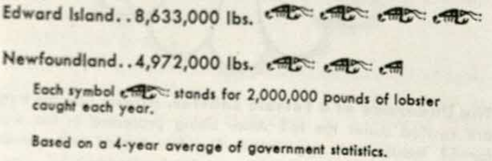
The lobster sits all day in its burrow waving its feelers outside, with its pincers ready to pounce on any passing prey. At night, the lobster comes out on tiptoes and searches for anything that it can eat. At the approach of any large fish or octopus, the lobster shoots back into its burrow with quick, powerful flips of its tail.

A growing lobster periodically *molts*, or sheds its hard shell for a soft new one. The new shell forms beneath the old one. Then the old shell splits down the back and the lobster crawls out. After the lobster emerges, the new shell expands to a larger size, then slowly hardens. The defenseless lobster must hide in its burrow or some safe crevice until the new shell hardens. The colors of lobster shells vary. They are usually dark green, but some are red. All lobsters turn red when boiled.

Lobster Fishing. Lobsters rank as an important sea food. At one time, lobster fishermen took as many as 100,000,000 lobsters from the sea in a single year. Some of these weighed as much as 15 pounds or more. This sort of fishing made large lobsters rare. The price of lobsters has risen steadily, and the average lobster sold at market now weighs 2 pounds or less. Lobsters might have died out completely, but laws were passed to protect them, and young lobsters were raised in areas where lobster fishing was forbidden.

Lobsters are caught in the Atlantic Ocean from Canada to Delaware, along the coast of northern Europe, and in the Pacific Ocean off the coast of California. Fishermen find them in waters down to a depth of about 600 feet. They catch the lobsters in traps called *pots*. The trap is a cage made of wooden slats. One end has a net shaped into a funnel, with the small opening inside the cage. The fisherman puts bait inside the trap. The lobster can easily go in through the funnel, but cannot find the small opening when he gets ready to go out again. The fishermen lower the traps to the bottom and connect them to floats on top of the water by strong cord. They must raise and empty the pots every day or so. If more than one lobster gets in a trap, the lobsters fight and may break each other's claws, which furnish much of the meat. The lobsters are thrown together again on their way to market. A peg is placed in the back of each claw to keep the claw from opening, so the warlike lobsters cannot fight.

LEADING LOBSTER FISHING STATES AND PROVINCES



Each symbol stands for 2,000,000 pounds of lobster caught each year.

Based on a 4-year average of government statistics.

Scientific Classification. Lobsters belong to the phylum *Arthropoda*. They are in the class *Crustacea*. They belong to the order *Decapoda*, and make up the family *Nephropsidae*. The American lobster is classified as genus *Homarus*, species *americanus*. The European lobster is classified as *H. vulgaris*.

WILFRID S. BRONSON

See also CRAB; CRAYFISH; CRUSTACEAN; PRINCE EDWARD ISLAND (color picture, Lobstermen); SHRIMP.

LOBWORM is a distant relative of the earthworm. It is also called *lugworm* or *lugbait*. Deep-sea fishermen often use this worm for bait. Lobworms are found along the Atlantic coasts of North America and Europe and around the Mediterranean Sea. They live under water, in burrows dug into the sand. During low tide, the burrows may be exposed. The lobworm's body is from 5 to 8 inches long, and is made up of rings or segments. The front end of the body is thicker than the hind end, and it is covered with bristles. The lobworm breathes with 13 pairs of tiny gills.

Scientific Classification. Lobworms are in the class *Polychaeta*. They make up the genus *Arenicola*.

J. A. MCLEOD

LOCAL GOVERNMENT. See CITY AND LOCAL GOVERNMENTS.

LOCAL OPTION means *local choice*. The term refers particularly to the right of any political division to determine for itself the conditions under which intoxicating liquors shall be sold. The privilege temporarily lost its force during the period of national prohibition. A township, city, county, or state may now again determine by vote whether or not liquor is to be sold. If liquor is to be sold, it can decide under what conditions. An act of legislature is required to give the right of local option to the people. Authority is then granted to the communities to determine the liquor and tavern question according to local opinion. The legislature names the smallest political district in which local option may be used. A majority vote by the eligible voters in the district determines the choice. In Canada, provincial government control of liquor prevails. An exception is the province of Quebec, where the license system is in force. JOHN A. KROUT

See also PROHIBITION.

LOCARNO CONFERENCE resulted in the Rhineland Security Pact and six other treaties. In October, 1925, representatives of seven European countries met in Locarno, Switzerland, to discuss plans for building permanent peace in Europe. Historians call this meeting the *Locarno Conference.* Delegates came from Belgium, Czechoslovakia, France, Germany, Great Britain, Italy, and Poland. As the most important problem of the conference, the delegates faced the task of finding a settlement between France and Germany. For the first time since World War I, the conference treated Germany as a friendly nation. When the conference ended on Oct. 16, 1925, the delegates in attendance had signed seven treaties.

The Rhineland Security Pact developed as the most important of these treaties. Belgium, France, Germany, Great Britain, and Italy signed the pact. Belgium, France, and Germany agreed never to fight each other again. Germany agreed to join the League of Nations. The treaty set up a neutral zone in the Rhineland, an area covering Belgian, French, and German soil. All signing powers vowed to guarantee the frontier between France and Germany and between Belgium and Germany. This meant that if Germany attacked France, the other nations would go to the aid of France.

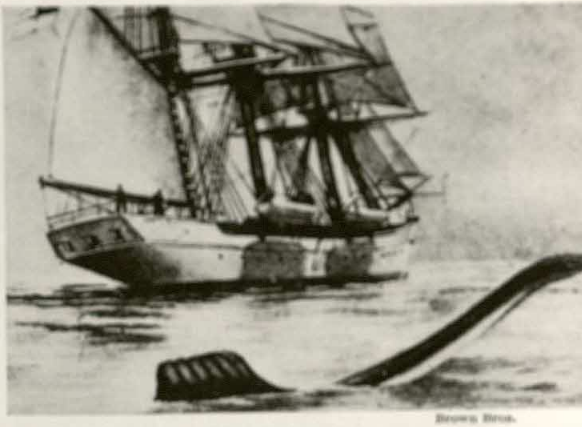
The six other Locarno Conference treaties bound the participating nations to the peaceful settlement of international quarrels. Each country promised to discuss its problems before resorting to war. The treaties set up rules for settling any disputes, and were called arbitration agreements. Germany signed such an agreement with Belgium, Czechoslovakia, France, and Poland. France alone promised to help Poland and Czechoslovakia if Germany broke its pledges to them.

In 1936, Germany denounced the Locarno treaties and sent its troops into the neutral Rhineland. The other Locarno powers did not act. They merely agreed to observe the old treaties until a better one could be found. But they could not prevent the series of aggressions that brought on World War II. NORMAN D. PALMER

LOCH. See SCOTLAND (Rivers and Lakes).

LOCH KATRINE is a beautiful lake in the highlands of Scotland which Sir Walter Scott made famous in his poem *The Lady of the Lake*. The heroine, Ellen, lived on Ellen's Isle and the action took place in the surrounding mountains. Loch Katrine lies in a deep hollow, and is eight miles long and a mile wide. It is a popular tourist resort and serves as the principal water supply for Glasgow. FRANCIS H. HERRICK

LOCH LOMOND, *LO mund*, is the largest and one of the most famous of the Scottish lakes. The lake lies about twenty miles northwest of Glasgow in the Scottish highlands. Loch Lomond is in a hilly region, and its waters have many islands. The lake is 23 miles long and 5 miles wide at its widest point. Ben Lomond (3,192 feet), a peak in a branch of the Grampian Mountains, is on the edge of the lake. One of the most familiar Scottish folk songs is about Loch Lomond. In ancient days, Scottish clans gathered for meetings at the edge of this lake. FRANCIS H. HERRICK


Brown Bros.

The Legendary Loch Ness Monster rises from the sea in this drawing, based on the sketch of a person who claimed he saw it.

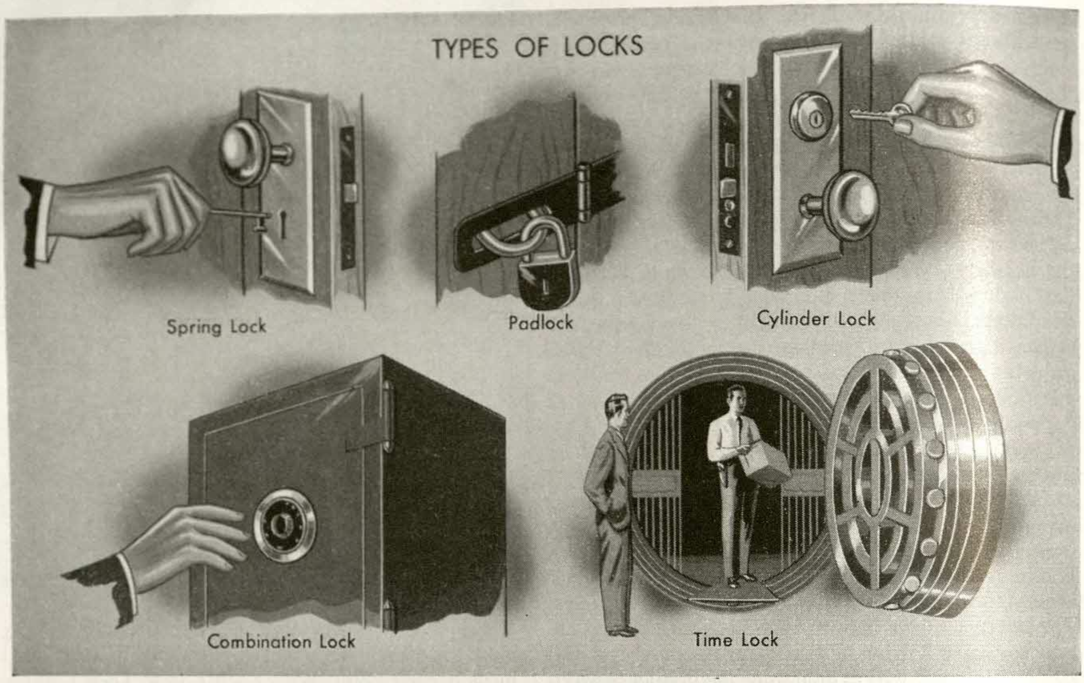
LOCH NESS is a lake in northern Scotland. Reports of a sea monster living in its depths have made it the object of much study and interest. Loch Ness is 24 miles long and 1 mile wide. It is about 750 feet deep in its deepest point. With Loch Lochy, Loch Linnhe, and the Firth of Lorne, it is part of the Caledonian Canal system. The system cuts diagonally in a straight line across Scotland, from the Atlantic Ocean to the North Sea. The Ness River which drains Loch Ness flows into Moray Firth, about seven miles northwest of the loch. A number of mountains rise along the shores of Loch Ness. For location, see GREAT BRITAIN (color map).

Speed boat records have been set on Loch Ness. However, the lake is best known for the "Loch Ness Monster." A number of people claim to have seen the monster rising above the surface. It has been described as a scaly creature about 30 feet long. Reports of a monster date back to the 1200's and have increased since the 1930's. FRANCIS H. HERRICK

LOCHINVAR, *LAHK in VAHR*, is a story poem by Sir Walter Scott which forms a part of *Marmion*, a much longer poem. It is patterned after the old ballads, with simple style, swinging meter, and musical last lines. But it does not have any of the authentic medieval touches which mark the old ballads. The story is simple. The gallant knight Lochinvar has been rejected by the father of the lovely Ellen, but appears at her wedding feast. He dances with the bride and carries her away on his horse, all with her consent. The family gives chase, but the couple escapes. GEORGE F. REYNOLDS

LOCHNER, STEPHEN (1390?-1451), was one of the most important German painters of the 1400's. He led a group of artists who worked in Cologne. Mysticism characterizes his work. Lochner painted Virgin Marys and saints with downcast eyes, absorbed in pious contemplation and heedless of their surroundings. His work resembles that of the Flemish artist Jan van Eyck, but is less realistic. Lochner's birthplace is unknown, but he came to Cologne about 1430 from the district around Lake Constance. One of his most famous paintings is *The Adoration of the Magi.* LESTER D. LONGMAN

LOCK, in canal construction. See CANAL (Canal Locks; color pictures).


TYPES OF LOCKS

LOCK AND KEY. The need for a device to protect people and property from unwelcome intruders is as old as mankind. Primitive man probably made the first attempt to meet this need when he rolled a boulder in front of the entrance to his cave. As civilization developed, other primitive methods were used to protect doors. Sometimes medicine men or high priests of cults reinforced these primitive methods by casting a magic spell upon the door.

Today, locks protect nearly all the wealth of the world. Individuals protect their homes with small household locks that can be opened by keys. Banks keep the savings of people and businesses in huge metal vaults protected by heavy metal locks that can be opened only at certain times of the day. Locks fasten the doors of the heavy underground vaults where nations store their gold. Today's locks are developments of a crude wooden device that the Egyptians invented 4,000 years ago.

The Egyptian Lock, invented around 2000 B.C., was the first device that was a true key-operated lock. It consisted of a large wooden bolt operated by a big wooden key that looked like an oversized toothbrush. This lock was fastened to the outside of a gate. It had pins, or pegs, that fell by gravity into holes in the bolt. The pins then prevented the bolt from being moved until they were lifted from the holes. This was done by inserting the key. It had pegs on the end corresponding to the bristles on a toothbrush. These wooden pegs lifted the pins out of the holes in the bolt so that the bolt could be moved and the gate opened.

The Ancient Greek Lock was the next contribution to lock development. The Greeks were the first to fasten the bolt to the inside of a door and still be able to move it from the outside. They did this by devising a huge key shaped like a sickle which they inserted from the outside through a hole in the door. The shape of the key made it possible to engage the bolt on the inside and slide it back. The hole through which these ancient people inserted the key ranks as the first keyhole. The unwieldy key was a major disadvantage of the Greek lock, but its curved shape made it possible for a man to carry it over his shoulder. The Greek poet, Homer, gave us the description of this locking device about 700 B.C.

The Ancient Roman Lock. The technically minded Romans reapplied the Egyptian "pin" principle, but they made their pins in widely varying geometric shapes. The use of variation in pin shapes, or *profiles*, increased security by making it less likely that the key for one lock would open any other. This profile variation is used in lockmaking today.

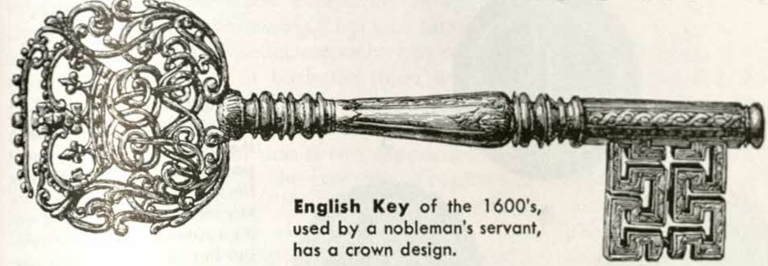
Roman locks were much smaller than those developed by earlier peoples. The Romans also improved on the Egyptian design by incorporating springs into their locks to press the pins into the bolt. The Egyptians had simply depended on gravity to drop the pins into the bolt. Keys for these Roman locks often were made into rings and worn on the finger.

Later, the Romans invented *warded locks*. They served as the most frequently used security devices until the middle of the 1800's, and many are still in use. Their mechanism contains a series of obstacles, or wards, which the key must pass in order for the bolt to be retracted. Thus the *key bit*, which is the part of the key that enters the lock, must be cut to correspond with a particular set of wards.

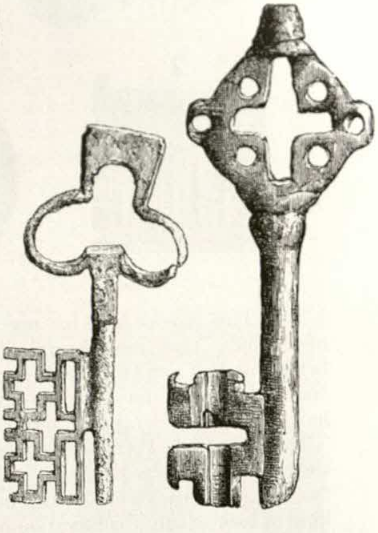
After these developments, no basic change in lock design occurred for many centuries. During this period, alarm and trapping devices were incorporated into locks, keyholes were hidden under ornamentation, and wards became more and more intricate. But no significant changes in the protective capabilities of locks occurred.

The Lever Tumbler Lock was developed in the late

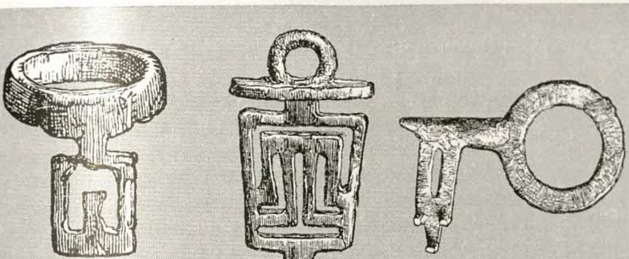
KEYS THROUGH THE AGES



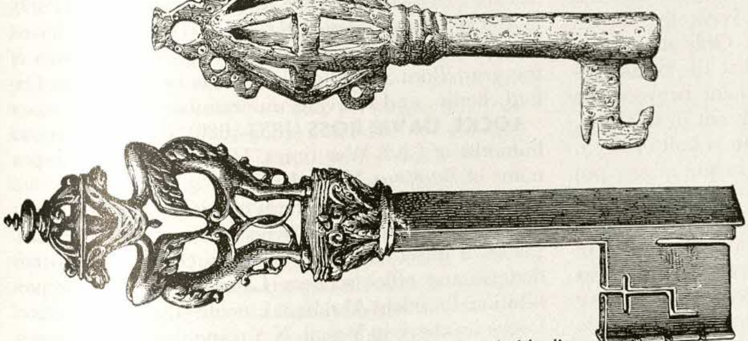
English Key of the 1600's, used by a nobleman's servant, has a crown design.



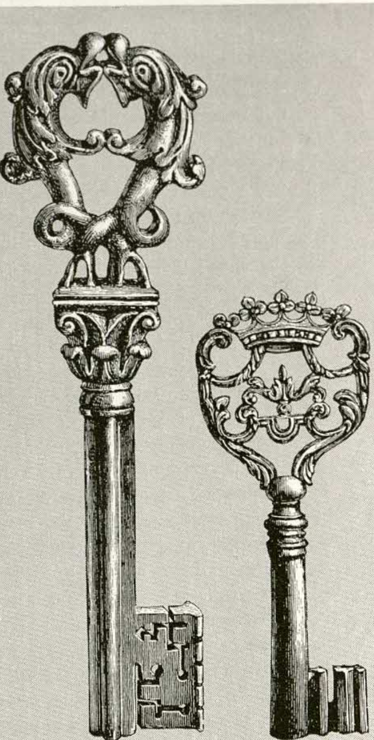
Iron Key, *left,* of the 1300's was for an English abbey. Bronze key, *right,* of Middle Ages was for an English castle.



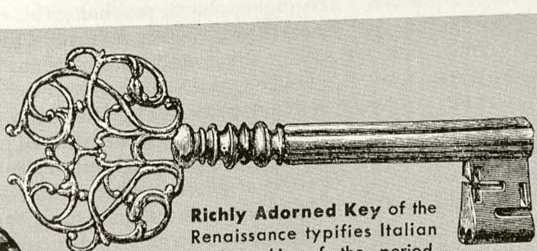
Roman Locksmiths made keys from bronze and iron. The key ring, *left,* latch key, *center,* and key, *right,* are made of bronze.



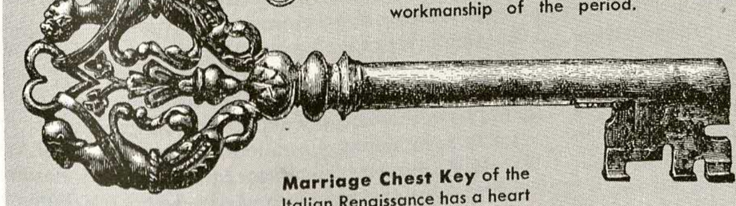
Medieval Bronze Key, *top,* shows bold religious lines of Gothic architecture. Griffins decorate the handle of a Renaissance key, *bottom.*



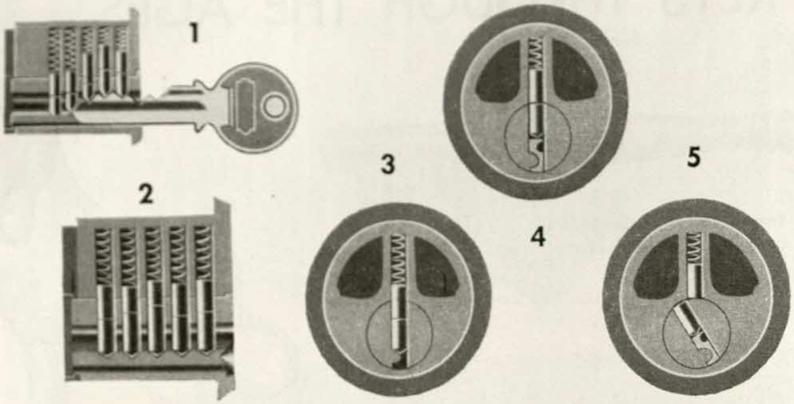
Dolphins decorate the handle of an Italian key of the 1600's, *left.* Foliage supports a crown on the handle of a type used in Germany and Italy in the 1600's, *right.*



Richly Adorned Key of the Renaissance typifies Italian workmanship of the period.



Marriage Chest Key of the Italian Renaissance has a heart design supported by figures.



A Yale Lock is shown in a side view (1) with a key raising the pins, and (2) in the locked position. The front views show the lock (3) locked, (4) with the key inserted, pins aligned with the cylinder, and (5) the cylinder turned to operate a bolt.

1700's. This type of lock has one or more levers in its mechanism. They must be raised to an exact height before the bolt can be moved. Any key other than the correct key does not raise the levers to precisely the height necessary in order to move the bolt.

The Yale Lock. Perhaps the most dramatic event in the history of lockmaking took place in 1865, when an American, Linus Yale, Jr., invented an entirely new kind of lock which was based on a principal similar to that of the ancient Egyptian lock. This invention was the *pin-tumbler cylinder lock*, which today is still the most secure key-operated locking device known to man.

Within the case of the pin-tumbler cylinder lock is a series of pins and drivers that extend vertically through the cylinder and into an inner plug. Only the correct key raises the pins and drivers so that the breaks between them are lined up with the joint between the cylinder and its plug. When precisely set in this way, the key can rotate the plug to activate a bolt or latch. A minute variation from the proper height of any pin prevents the key from being turned.

In addition to being important because it provides a degree of security unattainable with any other kind of key-operated lock, the pin-tumbler cylinder lock was the first to be ideally suited to mass production. Henry Robinson Towne, an American engineer, joined Yale in 1868 to mass-produce the new invention. The application of economical mass-production techniques brought the security of locks within the means of everyone. The pin-tumbler cylinder lock also made it possible to replace the bulky, cumbersome keys that had previously been in use with the small, flat keys familiar today.

Combination and Time Locks. Any lock with a keyhole can be unlocked, or *picked*, by an expert. Because of this, combination and time locks are used on safes and vaults that contain valuables. These locks are worked by dials that are turned certain distances back and forth to release the tumblers. The combination lock usually has a series of numbers around the dial. The series of numbers at which the dial is stopped and the direction in which it must be turned to reach these numbers is called the *combination*. The average combination lock has from 100,000 to 1,000,000 possible combinations. In many businesses and banks, only a few individuals are entrusted with the combination to the firm's vault to lessen the chances of unauthorized persons learning the combination.

Time locks are usually combination locks that can be opened only at certain times, even if the correct combination is known. THOMAS S. KAIDEN

See also TIME LOCK.

LOCK HAVEN STATE COLLEGE is a coeducational state teachers college at Lock Haven, Pa. Courses in teacher training and physical and health education lead to bachelor's degrees. The school was founded in 1870. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LOCKE, ALAIN LEROY (1886-1954), was an American educator and a writer on Negro culture. From 1912 to 1953, he taught philosophy at Howard University. His works include *The Negro in America* (1933), *The Negro and His Music* (1936), *Negro Art—Past and Present* (1937), and *When Peoples Meet* (1941). In 1942, he was selected in a poll as one of the most distinguished Negroes of the year. Born in Philadelphia, Locke studied at Oxford, Berlin, and Harvard universities. JOHN O. EIDSON

LOCKE, DAVID ROSS (1833-1888), was an American humorist of Civil War times. He wrote under the pen name of *Petroleum V. Nasby*.

Locke's work took the form of misspelled letters from an ignorant Kentuckian who was an evil character. Locke, a bitter satirist, attacked such persons as draft dodgers and office seekers. Later, he worked for prohibition. President Abraham Lincoln enjoyed his humor. Locke was born in Vestal, N.Y., and worked as a newspaperman in Ohio. EDWARD WAGENKNECHT

LOCKE, JOHN (1632-1704), has sometimes been called "the intellectual ruler of the eighteenth century." His philosophical, psychological, educational, and political theories widely influenced the thinkers of his day, and are still considered important.

Locke's political theories had a strong effect on colonial America. Thomas Jefferson used many of his ideas in writing the Declaration of Independence. Locke expressed his political philosophy in *Two Treatises of Government* (1690) and in four letters on *Toleration* (1685-89). He favored freedom of thought and of religion, both on moral and on practical grounds. He believed that the sole business of government is to protect the lives, liberty, and property of people. If government does not do this, Locke declared, men have a right to find other rulers. No matter who rules, he thought, the people should have the final say about the government.

Locke's philosophy contrasted with that of rationalists like René Descartes (see DESCARTES, RENÉ). Descartes believed that man can reach all important conclusions by a process of deductive reasoning, while Locke was an empiricist, depending upon experience. In his *Essay Concerning Human Understanding* (1691), he argued that almost all of man's knowledge comes by way of perception. He believed that at birth the mind is a blank tablet, on which experience later writes. One of the chief mental processes, Locke said, is the "association of ideas." By this he meant that if two experiences have often occurred together in the past, the occurrence of one of them in the future is likely to cause a person to think of the other.

Locke was born at Wrington, England. He was educated at Oxford University and later studied medicine. He became the physician and friend of the Earl of Shaftesbury, a prominent politician and opponent of the Stuart kings. As a result of this opposition, Locke had to spend some years in exile in The Netherlands. When James II was overthrown, he returned and won the favor of the new government. W. T. Jones

LOCKHEED AIRCRAFT CORPORATION. See Airplane (Leading Airplane Companies).

LOCKJAW, or **TETANUS,** *TET uh nus,* is a severe disease that affects the central nervous system, often causing death. It is called *lockjaw* because severe spasms of the jaw muscles make it difficult for the victim to open his mouth.

Cause. Lockjaw is caused by *toxins,* or poisons, produced by bacteria called *Clostridium tetani* or *tetanus bacillus,* which live in dirt. They thrive in the dust and earth of streets or houses, around stables, and in gardens. They also live in manure, on dirty splinters of wood, dirty nails, and other such objects. Tetanus bacilli grow best where there is very little oxygen. They get into the body through wounds. The wounds may be as tiny as a pin prick, or may be large, deep cuts. Any wound that becomes contaminated by soil may harbor tetanus bacteria. If the injured tissue receives little oxygen, the bacteria will grow and thrive.

Symptoms of tetanus may begin to appear from about five days to five weeks after infection. The victim feels depressed and complains of headaches. Soon it becomes difficult to open the mouth and to swallow. As the disease progresses, all of the body muscles may become taut. At this point, any stimulation may cause violent, extremely painful *spasms,* or contractions of the muscles. A sudden draft of air or a noise may cause such intense spasms that the victim's whole body may arch. These spasms usually do not last very long, but they may be long enough to interfere with respiration. Although the patient is unable to talk, he remains conscious. Death, usually from exhaustion, occurs in nine out of ten untreated patients.

Treatment and Prevention. Doctors treat tetanus with injections of tetanus antitoxin, but tetanus can be prevented. All puncture wounds, and any wound that might be contaminated with soil, require immediate care. A doctor will clean the wound thoroughly and give injections of antitoxin to prevent the development of tetanus. Once tetanus has developed, the victim must go to a hospital. People can also be immunized. Doctors give inoculations of tetanus toxoid to prevent the disease. Then, when a person is injured, a doctor only needs to give a booster injection. This assures continuous immunity to tetanus. John A. Bigler

LOCKOUT occurs when an employer closes his plant in order to keep employees from working. The employer is using the economic weapon of a work and wage stoppage to get employees to agree to some particular condition of work or wages which he desires. The lockout is like the *strike* in that it is an economic weapon used in labor disputes. It differs from the strike, however, because the strike is a work stoppage which the employees themselves start in order to compel the employer to meet certain demands. Lockouts, like strikes, are usually caused by wage disputes. But the number of lockouts is far less than the number of strikes. Lockouts make up only about 3 to 4 per cent of the total number of work stoppages. The reason for this is that employers have more direct and effective means of economic pressure on workers, such as discharging individual workers involved in labor disputes. Many lockouts and other types of labor disputes occur in the coal-mining, clothing-manufacture, building, and textile industries. See also Labor (Strikes and Lockouts); Strike. Robert D. Patton

LOCKWOOD, BELVA ANN BENNETT (1830-1917), was a reformer and woman-suffrage leader. She was one of the few women nominated for President of the United States. She taught school for many years, and became a lawyer in 1873. She worked for women's rights, and won equal pay for women government employees, and a law allowing women to practice before the Supreme Court. In 1884 and 1888, the Equal Rights party nominated her for President. She was born at Royalton, N.Y. Louis Filler

Brown Bros.

Belva Lockwood

LOCKWOOD, CHARLES ANDREWS (1890-), a vice-admiral in the United States Navy, became the outstanding American submarine expert of World War II. He directed American underseas warfare in the Pacific. Between 1943 and 1945, forces he commanded sank more than 1,000 enemy ships and damaged at least 500 others, a major cause for the defeat of Japan.

Lockwood was born in Midland, Va., and was graduated from the U.S. Naval Academy. He retired in 1947, and wrote several books dealing with submarine warfare. Donald W. Mitchell

LOCO-FOCO was a nickname given in 1835 to the radical faction of the New York Democratic party.

In October, 1835, New York Democrats held a meeting in Tammany Hall. The radical Democrats spoke against favoritism in banking laws. They wanted to form an organization to fight that kind of legislation. The conservative party members were not strong enough to stop the proposal. They turned out the lights and left the hall. Members of the radical faction used phosphorus friction matches, newly invented and called "loco-focos," to rekindle the lights, and continued the meeting. The Democratic press immediately named the reform Democrats "loco-focos." John R. Alden

LOCOMOTION, in zoology, is the act or the power of animals to move from place to place. See Animal (Organs for Moving About).

Diesel Locomotives pull most passenger and freight trains, as well as performing yard-switching services. Some of the large engines have as many as four units.

Western Maryland Railway

LOCOMOTIVE, *LO koh MOH tihv*, is a machine used to move trains on railway tracks. Early locomotives weighed only 3 to 6 tons and could pull only a few lightweight cars. Today's locomotive may be a gigantic streamlined machine weighing more than 300 tons. It can have a top speed of more than 100 miles an hour, and pull more than 100 freight cars at a time.

Railroads use many types of locomotives, but most of them can be divided into three main groups: (1) diesel, (2) steam, and (3) electric. Locomotives can also be divided into three groups according to the type of service they perform. These are: (1) passenger-train service, (2) freight-train service, and (3) yard-switching service.

At one time, steam locomotives pulled most railroad trains, and they still rank as one of the most important locomotives in many parts of the world. But in the United States, the diesel locomotive has almost entirely replaced other kinds. Diesels now perform 93 per cent of the passenger and freight service in the United States. Steam locomotives account for 5 per cent of the freight service. Electric locomotives account for the remaining passenger and freight service.

Kinds of Locomotives

Diesel Locomotives are traveling power plants. They have diesel engines that supply the power to turn electric generators. The generators produce direct-electric current to run electric motors that turn the locomotive's driving wheels. The diameters of the driving wheels on diesel locomotives range from 36 to 42 inches. A diesel locomotive may have about 70,000 parts and over 2 miles of electric wiring. Because they use electricity, diesel locomotives are also known as *diesel-electric* locomotives.

Diesel locomotives have a number of advantages. They generate their own power and do not depend on overhead wires or third rails as electric locomotives do. For this reason, they can operate anywhere that there are rails. A diesel locomotive can also make long runs without refueling or servicing. Unlike steam locomotives, which require time to get up steam pressure, the power of a diesel locomotive is instantly available. Diesel locomotives can be quickly stopped or started, and they speed up faster than steam engines. They also have a higher fuel efficiency than steam locomotives, require less servicing, and cost less to maintain.

A diesel locomotive may consist of from one to four connecting units. These units are of two general types, called A and B. An *A unit* is designed and equipped for use by itself or as a lead unit when a number of units are combined. A *B unit* does not have the necessary equipment to serve as a lead unit, and is capable of only limited independent movement. A diesel locomotive may consist of one A unit operated singly, or of two, three, or four A and B units coupled together.

Diesel locomotive units range from 400 to 3,000 horsepower each. Most of those in freight and passenger train service run from 1,500 to 2,000 horsepower. Two 2,000-horsepower units coupled together make a 4,000-horsepower locomotive. Three such units produce a 6,000-horsepower locomotive, and so on.

Railroads use a system of letters and numbers to classify the types of diesel locomotives by the number of driving axles and idler axles they have. The letter A stands for one driving axle, B for two, C for three, and D for four. The number 1 stands for one *idler* (nonpowered) axle, 2 for two such axles, and so on. The axles are often combined into units called *trucks*. Most United States diesel locomotive units are included in four standard types:

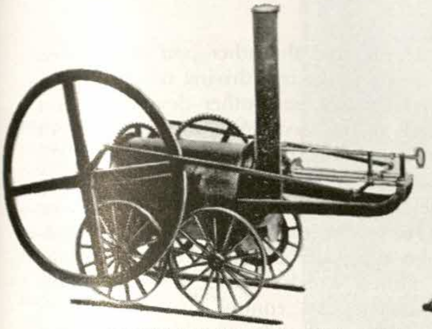
A1A-A1A—two swivel 6-wheel trucks, each truck with a center idler axle.

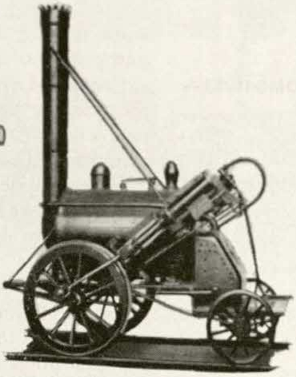
B-B—two swivel 4-wheel trucks, all driving axles.

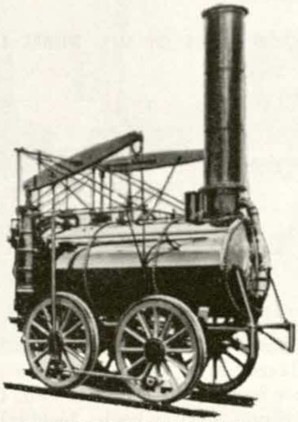
C-C—two swivel 6-wheel trucks, all driving axles.

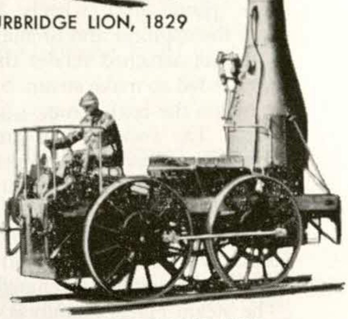
B-A1A—one swivel, 4-wheel truck, all driving axles; and one swivel 6-wheel truck with a center idler axle.

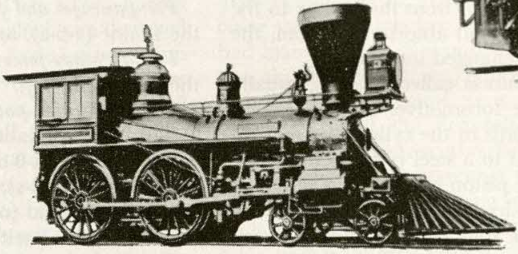
DEVELOPMENT OF THE LOCOMOTIVE

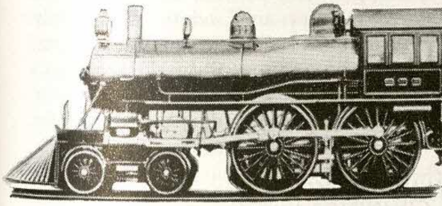

RICHARD TREVITHICK'S LOCOMOTIVE, 1804

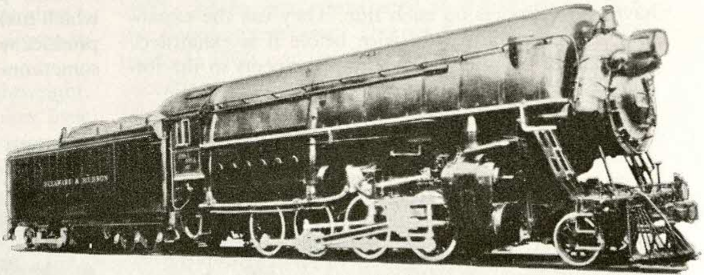

GEORGE STEPHENSON'S ROCKET, 1829

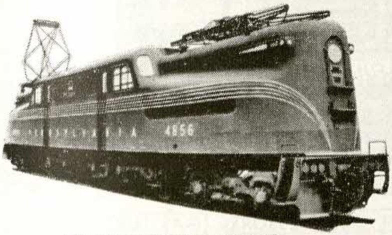

STOURBRIDGE LION, 1829

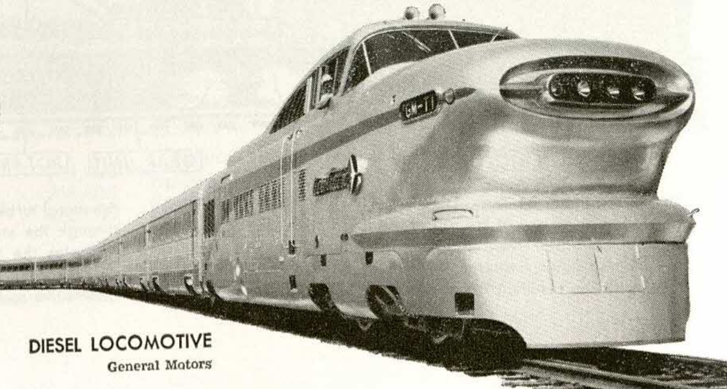

BEST FRIEND, 1830


THE GENERAL, 1855


LOCOMOTIVE 999, 1893


JOHN B. JERVIS, 1927


ELECTRIC LOCOMOTIVE


DIESEL LOCOMOTIVE

General Motors

—STANDARD TYPES OF U.S. DIESEL LOCOMOTIVES—

	Horsepower
Passenger Service	
*A1A-A1A	2,000 to 2,400
B-B	1,500 to 2,000
B-A1A	1,600 to 2,400
Freight Service	
B-B	660 to 2,400
C-C	1,500 to 2,400
B-A1A	1,600 to 2,400
Switching Service	
B-B	400 to 1,750
C-C	1,500 to 2,400

*For explanation of numbers and letters, see the text.

Steam Locomotives are complex machines containing tens of thousands of parts. The main parts of a steam locomotive include the frame, firebox, boiler, cylinders, pistons, piston rods, wheels, headlight, bell, and a cab for the engineer and fireman. Every steam locomotive has an attached tender that carries the fuel and water needed to make steam. Steam provides the force that makes the engine run.

Power. The *boiler* of a steam locomotive is a long cylindrical compartment of steel with the firebox at the back end and the smokebox at the other end. Coal or fuel oil is burned in the *firebox*. Many tubes called *flues* carry the smoke, heat, and gas from the firebox to the *smokebox*. Water surrounds, and absorbs heat from, the firebox and flues, and is changed into steam.

The steam enters chambers called *cylinders*, usually one on each side of the locomotive. Steam pressure forces *pistons* back and forth in the cylinders. One end of each piston is attached to a steel rod called a *piston rod*. The other end of the piston rod connects to one of the locomotive's large driving wheels. Most steam locomotives have three or four pairs of driving wheels up to 80 inches in diameter. Some have even more. *Side rods* connect the driving wheels so the pistons exert their power equally on all the driving wheels.

Some steam locomotives called the *compound type* have two cylinders on each side. They use the expansion power of the steam twice before it is exhausted. One pair of cylinders and pistons connects to the forward driving wheels, and the other pair of cylinders and pistons connects to the rear driving wheels.

Controls. Levers, valves, and other devices connect the working parts of the locomotive to the engineer's cab. The engineer controls the amount of steam to the cylinders with a *throttle valve*. With the throttle and other control devices, the engineer can start, stop, speed up, slow down, or reverse the direction of the locomotive. He can also apply the air brakes throughout the train, operate *injectors* which transfer water from the tender to the boiler, and control the locomotive's whistle, bell, and the sanding device which drops sand on the tracks to keep the wheels from slipping.

In addition to driving wheels, steam locomotives have one or more pairs of small *pilot wheels* mounted as a swivel truck in front of the engine. These wheels guide the engine around curves. Steam locomotives may also have similar pairs of small wheels under their cabs.

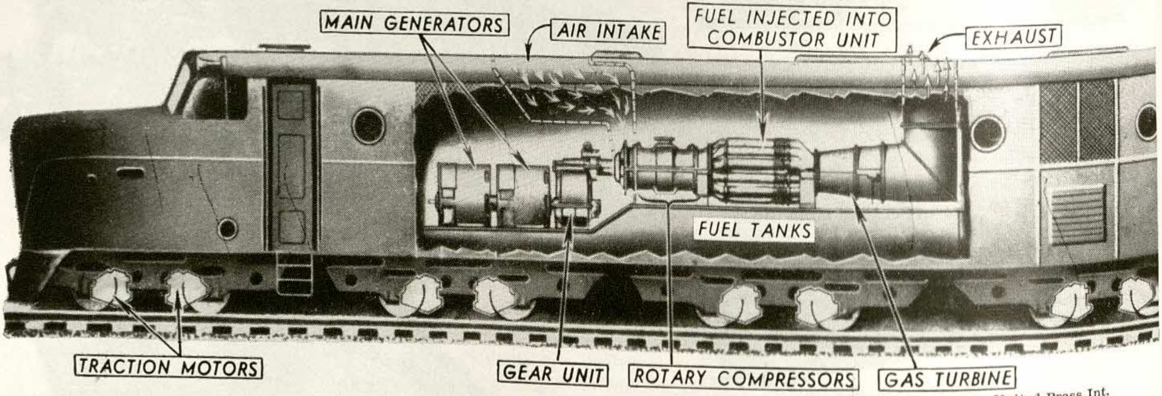
Types. Steam locomotives are known by the number and arrangement of their wheels. Many types were developed to meet special conditions, such as providing speed, or power in mountainous regions. The first distinctive American locomotive, developed by 1850, had two pairs of pilot wheels and two pairs of driving wheels. It was known as the 4-4-0. Other notable types included:

For passenger and freight service—the Atlantic (4-4-2), the Prairie (2-6-2), and the Mountain (4-8-2).

For fast heavy passenger service—the Pacific (4-6-2) and the Hudson (4-6-4).

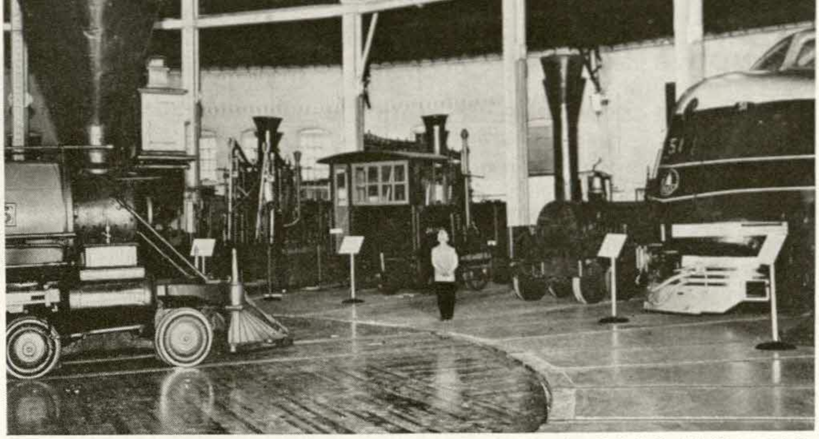
For high-speed powerful freight service—the Mogul (2-6-0), Consolidation (2-8-0), Ten-Wheel (4-6-0), Twelve Wheel (4-8-0), Decapod (2-10-0), Berkshire (2-8-4), Mikado (2-8-2), Santa Fe (2-10-2), Texas (2-10-4), Mallet compound (0-6-6-0), Northern Pacific (4-6-6-4), and the Union Pacific "Big Boy" (4-8-8-4).

Electric Locomotives are ready for instant use, and can be quickly stopped, started, and brought to full speed. For this reason, they are used to pull heavily traveled passenger trains, such as commuter trains, which make frequent station stops. Electric locomotives produce no smoke or exhaust gases. Therefore, they are sometimes preferred in heavily populated areas, and for



United Press Int.

Cross Section of Gas-Turbine Electric Locomotive. Air enters the air intake at the top of the locomotive, and its pressure is increased about fivefold in the compressors. Then the air passes to combustors, or burners, where it aids the burning of fuel oil and cools the resulting gases to about 1,350° F., a temperature the metal turbine blades will withstand. Expansion of these gases through the stationary and rotating blades of the turbine unit operates the turbine. The turbine turns the electric generators which power the traction motors on eight axles. Building this locomotive cost $2,000,000.



Historic Locomotives are housed in a huge, umbrella-like roundhouse of the Baltimore and Ohio Transportation Museum in Baltimore. They make up a part of the world's finest train collection. The collection includes a replica of the *Tom Thumb* locomotive, built in 1830.

© 1958, *Du Pont* Magazine, E. I. du Pont de Nemours & Co.

underground railroads and railroads that run through tunnels. Electric locomotives are also used to pull heavy trains over steep mountain grades. In some countries that lack coal and fuel oil, they may be cheaper to operate than other kinds of locomotives.

Electric locomotives have smaller driving wheels than steam locomotives. They are classified as to type by the same letter and number system used for diesel locomotives. Some electric locomotives obtain their electric power from overhead wires. They have a hinged steel framework called a *pantograph* which can be raised to make contact with the wires, or folded down when not in use. Other electric locomotives get their power from a third rail. In either case, a contact device called a *shoe* slides along the wire or the rail.

Other Kinds of Locomotives include the gas-turbine electric and the ignitron rectifier locomotives.

The Gas-Turbine Electric Locomotive has a power unit consisting of a compressor, a combustion unit, and a turbine. The compressor forces compressed air into the combustion unit where oil, natural gas, or finely powdered coal is burned. This produces a blast of hot gases that operate the turbine (see TURBINE [Gas Turbines]). The turbine drives both the compressor and four direct-current electric generators that furnish the power to operate eight electric traction motors.

Such gas turbines can operate small, lightweight, but powerful locomotives. The turbine requires little lubrication and no water. These locomotives can make runs of more than 1,000 miles without refueling. They are designed for fast, long-haul freight service in mountainous regions and at high altitudes.

The Ignitron Rectifier Locomotive works much like the standard electric locomotive except that it uses single-phase alternating current instead of direct current. The locomotive draws the alternating current from overhead lines, and then *rectifies*, or changes it to direct current, with sealed *ignitron tubes* (see ELECTRONICS [Mercury-Pool Rectifiers]). The direct current is fed to regular electric traction motors.

WEIGHT AND COST OF U.S. LOCOMOTIVES

	Avg. Weight Tons	Cost
Passenger Service		
Diesel	114-180	$213,000
Steam	293	252,000
Electric	261	442,000
Freight Service		
Diesel	51-193	164,000
Steam	327	256,000
Electric	123-189	442,000
Switching Service		
Diesel	44-193	123,000
Steam	144	105,000

History

Richard Trevithick of England invented the steam locomotive in 1804. In 1825, Colonel John Stevens built the first steam locomotive in the United States. This locomotive, an experimental model, ran on a circular track at Hoboken, N.J. These first locomotives had many failings. Not until 1829 did George Stephenson, another Englishman, build the first really successful locomotive. That same year, a Pennsylvania canal company tested the first full-size locomotive to be operated on a commercial railroad in the United States.

The first steam locomotive to be placed in regular passenger and freight service in the United States was built in New York City. It operated out of Charleston, S.C., and went into service on Christmas Day, 1830. Steam railway transportation then developed rapidly.

The steam locomotive ruled as king of the rails until the introduction of the electric locomotive in the late 1800's. Many men contributed to the development of the electric locomotive. Thomas Edison tested his first model in 1880, and the first electric street railway began operating in Germany in 1881. In 1895, the first electric locomotives were placed in regular railroad service by the Baltimore and Ohio Railroad in Baltimore.

Diesel locomotives were introduced experimentally in 1923, when a switching unit was tested by several American railroads. In 1925, the first diesel placed in regular service by an American railroad began switching operations in a New York City freight yard. The first passenger diesels went into operation in 1934, and the first freight diesels in 1941.

In 1960, United States railroads owned approximately 29,500 locomotives. Of this number, about 28,200 were diesel, about 700 were steam, and about 550 were electric. The remaining 50 consisted of other types, chiefly gas-turbine locomotives. CHARLES O. MORGRET

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Stephenson
Tom Thumb

LOCOMOTIVE ENGINEER. See RAILROAD (Careers in Railroading).

LOCOWEED is any one of several kinds of perennial herbs that grow in western North America. They have harmful effects when eaten by horses, cattle, or sheep. Locoweed gets its name from the Spanish word for *crazy*, because of the strange actions of animals poisoned by it.

There are about a hundred kinds of locoweeds, but many are not known to be poisonous. Three of the more common kinds are the *white*, *purple*, and *blue* locoweed. They are named for the color of their flowers, which resemble those of peas or beans. The plants have erect or spreading stems with many leaflets on each stem.

The effect of locoweeds on animals depends on the soil in which the plants grow. Scientists believe that the plants' poisonous effects result from their ability to absorb poisonous elements from the soil. Both the green and the dry plants are poisonous. The symptoms of poisoning vary somewhat in horses, cattle, and sheep. Horses become dull, drag their legs, eat infrequently, and lose muscle control. Soon they become thin and die. Cattle react in much the same way. But sometimes they run wildly about, bumping into objects in their path. Sheep react more mildly to the poison. Animals raised on a range usually do not eat locoweeds when other food is available. Ranchers destroy locoweeds by cutting the roots about two inches below the surface, or by spraying the plants with the insecticide 2,4-D.

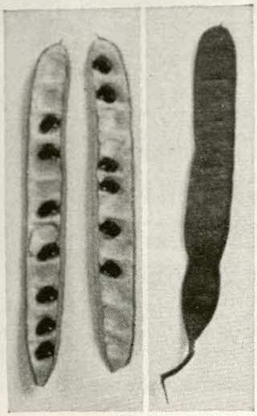
Scientific Classification. Locoweeds belong to the legume family, *Leguminosae*. The white locoweed is genus *Oxytropis*, species *lambertii;* the purple is *Astragalus mollissimus;* and the blue is *A. diphysus.* LOUIS PYENSON

LOCUST, *LOH kuhst*, is one of about 20 kinds of plants native to North America. Four of these are handsome shade trees that bear heavily scented flowers. The others are shrubs. The trees sometimes grow about 80 feet tall.

In the United States, the *black locust* is the best known locust. This medium-sized tree grows widely throughout the eastern United States and southern Canada. Like most locusts, the black locust has spines. Its fragrant flowers hang in drooping clusters. They are white, and look much like pea blossoms. The fruit consists of a long, glossy-brown pod with about a dozen wax-coated seeds. Black locusts have blue-green compound leaves.

The Graceful Flowers of the Locust are very fragrant and resemble sweet peas. The leaves are blue-green in color.

Devereux Butcher



U.S. Forest Service

The Long Locust Pods are filled with wax-coated seeds.

Locusts grow rapidly on good soil. On poor soils, locust borers kill the trees while they are still young. Another insect enemy, the leaf miner, may cause the leaves to turn yellow and fall off before the first frost.

Locust wood is commercially important, because it is hard and lasts for a long time. It is valuable for insulator pins, because it swells only slightly when wet. Locust wood is also important for its use as fence posts and for the hubs of wagon wheels.

Scientific Classification. Locusts are in the family *Leguminosae*. The black locust is genus *Robinia*, species *pseudoacacia*. Other American species include the Kelsey, *R. kelseyi;* the New Mexican, *R. neomexicana*, and the clammy locust, *R. viscosa.* T. EWALD MAKI

See also ACACIA; HONEY LOCUST; TREE (picture, Tree Shapes [Black Locust]).

LOCUST is any short-horned grasshopper, or a grasshopper with short antennae. The long-horned grasshoppers and katydids belong to another family. A number of cicadas also are called locusts, but they, too, belong to a different family.

Locusts have been known since ancient times for their habit of destroying crops. The book of Exodus in the Bible describes a locust plague in ancient Egypt.

Locusts visit almost every large area of land from time to time. Only extremely cold countries are free of these creatures. They travel in swarms and settle on a field like a blanket, eating every green stalk and leaf. One swarm by the Red Sea was believed to cover an area of 2,000 square miles. The Rocky Mountain locust destroyed millions of dollars worth of crops in the Mississippi Valley between 1870 and 1880.

No serious outbreaks of locusts occurred between 1880 and 1930. Then, between 1930 and 1940, grasshoppers were troublesome on the Pacific Coast and throughout the Southwest. They also destroyed crops in the states along the eastern side of the Rocky Mountains.

Great swarms of migrating locusts sometimes shut out much of the light of the sun. They interfere with railroad trains and make automobile travel dangerous. Millions of locust bodies are crushed into a slippery mass on the rails and highways. Train wheels spin and automobiles skid. Swarms have been known to travel from Saskatchewan to Texas. Others have been seen at sea, 1,200 miles from land.

Scientists and farmers have found several ways to fight locusts. Harrowing and plowing in the late fall destroy the eggs. The female locust lays her eggs in the

The Tiny Locust has destroyed crops in many parts of the world since ancient times. A migrating swarm of locusts, *right*, clouds the sky on the Kenya-Uganda border in Africa.

L. W. Brownell; European

ground in a case that usually holds about 25 eggs. In 1881, more than 1,300 tons of eggs were destroyed on the island of Cyprus. But the next year there seemed to be as many locusts as ever. Newly hatched locusts can be crushed beneath rollers. Great numbers have been caught and destroyed in a device called a *hopperdozer*. It is a long box hung between two wheels, with a pan of oil in the bottom and a broad canvas behind it. The farmer drives the hopperdozer across the fields, and the grasshoppers fly or jump, strike the canvas, and fall into the oil. The best method of control is to scatter *poison bran mash*, a mixture of bran and arsenic.

Scientific Classification. Locusts are in the order *Orthoptera*, and form the family *Locustidae*. CARL D. DUNCAN

See also CICADA; GRASSHOPPER.

LOCUST BREAD is bread made from the meal of the carob bean (see CAROB), which is sometimes called *locust bean* because the pod resembles a large locust.

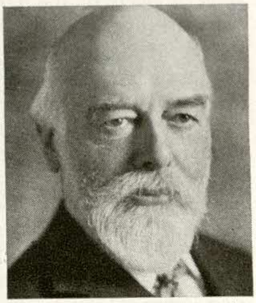
LODESTONE. See LOADSTONE.

LODGE is the family name of two American statesmen and U.S. Senators from Massachusetts, grandfather and grandson.

Henry Cabot Lodge (1850-1924) led Republican members of the Senate in a successful fight to keep the United States from joining the League of Nations after World War I. Lodge believed that the United States should take a larger part in world politics, but he disliked the League. He felt that it would involve the United States too greatly in European affairs. Lodge came from a wealthy Boston family, and was graduated from Harvard University. He became a noted historian and essayist before he won election to the U.S. House of Representatives in 1886. He was elected to the Senate in 1893, and served there for the rest of his life.

Henry Cabot Lodge, Jr. (1902-), was the running mate of Richard M. Nixon, the unsuccessful Republican candidate for President in 1960. Lodge was born in Boston. Following his graduation from Harvard University, he became a newspaperman. He served in the Massachusetts legislature from 1933 to 1936. Lodge entered national politics in 1936, winning election to the U.S. Senate. Lodge was re-elected in 1942, but resigned two years later to join the army. Massachusetts voters re-elected him to the Senate in 1946. Lodge led the group that persuaded General Dwight Eisenhower to run for the presidency in 1952. He helped manage Eisenhower's campaign. Eisenhower won Massachusetts, but Lodge lost his Senate seat to Representative John F. Kennedy. From 1953 to 1960, Lodge served as U.S. Ambassador to the United Nations. Kennedy and Lyndon B. Johnson defeated Nixon and Lodge in the 1960 presidential election. In 1961 he became consultant to Time, Inc., magazines. JOHN A. GARRATY

Henry Cabot Lodge, Jr.



Harris & Ewing

Sir Oliver Lodge

LODGE, SIR OLIVER JOSEPH (1851-1940), an English physicist, investigated the nature of oscillations and electric waves in wires and in wireless telegraphy. His discoveries helped in developing the radio. His works include *Modern Views of Electricity* (1889), *Electrons* (1907), and *The Ether of Space* (1909). He served as professor of physics at University College, Liverpool. Later, he became deeply interested in spiritualism. Lodge was born in Penkhull, England, and studied at the University of London. CARL T. CHASE

ŁÓDŹ, *lohdz* (pop. 671,000; met. area, 800,000; alt. 660 ft.), is the second largest city in Poland. Only Warsaw has a bigger population. Łódź stands about 70 miles southwest of Warsaw in the central part of the country. For location, see POLAND (color map).

Łódź is the leading manufacturer of textiles in Poland. It also has important metallurgical and paper plants, and makes chemical products and electrical appliances in a number of its busy factories.

The city was founded by the early 1400's. World Wars I and II both did severe damage to it. The Germans wiped out most of its large Jewish population during their occupation of Poland in World War II. The Poles founded a university at Łódź after the war, and also rebuilt the city. M. Kamil Dziewanowski

LOEB, *LOHB*, **JACQUES** (1859-1924), an American physiologist, made important studies of the chemistry underlying the activities of living organisms. He proved that eggs can be fertilized by artificial means. In his opinion, all aspects of life can be explained in terms of physical and chemical processes. His works include *The Dynamics of Living Matter* (1906), *The Mechanistic Conception of Life* (1912), *Artificial Parthenogenesis and Fertilization* (1913), and *Regeneration* (1924).

Loeb came to the United States from Germany in 1891. He taught at Bryn Mawr College and at the universities of Chicago and California. In 1910, he was appointed department head for experimental biology at the Rockefeller Institute for Medical Research. Before coming to the United States, Loeb taught at the universities of Würzburg and Strasbourg. He was born at Mayen, Germany, on April 7, 1859. Mordecai L. Gabriel

LOESS, *LO ehs*, is a kind of silt that forms a fertile topsoil in some parts of the world. Loess consists of tiny mineral particles brought by wind to the places where they now lie. These mineral particles are finer than sand but coarser than dust or clay. Topsoils made up of loess are found in the central and northwestern parts of the United States, in central and eastern Europe, and in eastern China.

Two great sources have provided most of the world's loess. One source is the area once covered by the great ice sheets of the Ice Age. When the ice melted, it left vast plains of bare mud. When these plains dried, winds blew the mineral grains to the grasslands farther south. The other source of loess is the great deserts of central Asia. These deserts furnished the loess now in eastern China. Ernest E. Wahlstrom

See also Dust; Ice Age.

LOEWY, *LOH ih*, **RAYMOND FERNAND** (1893-), is an industrial designer for corporations in the United States and other countries. He began as a fashion illustrator in 1919, and started designing when a British manufacturer asked him to improve the looks of his duplicating machine. Loewy became art director for Westinghouse Electric Corporation in 1929. The same year, he started the Raymond Loewy Corporation, an organization concerned with industrial design, and served as its president and board chairman. Loewy was born in Paris. In World War I, he served in the Corps of Engineers. Harold F. Williamson

Raymond Loewy

Alan Fontaine

LÖFFLER, *LEF ler*, **FRIEDRICH** (1852-1915), a German bacteriologist, discovered the diphtheria bacillus in 1884, with the help of Edwin Klebs. He then found a way to cultivate these organisms, and perfected a staining method so that they could be more easily observed under a microscope. He also developed a staining technique to demonstrate flagella, the whiplike structures used to propel some bacteria. In 1897, Löffler and Paul Frosch discovered the first known animal virus, the one that causes foot and mouth disease in cattle. Löffler was born in Frankfurt an der Oder, Germany. Stanley E. Wedberg

LOFOTEN, *LOH FOH t'n*, **ISLANDS** include several large islands and many islets off the northwest coast of Norway. They are famous for their fisheries, which are among the finest in the world. A line of coastwise steamers calls at nearly all the islands, which are 40 to 60 miles from the mainland. The chief source of income is codfishing. The population of about 40,000 is doubled during the spring, when the islands are dotted with the huts of fishermen from all parts of Norway.

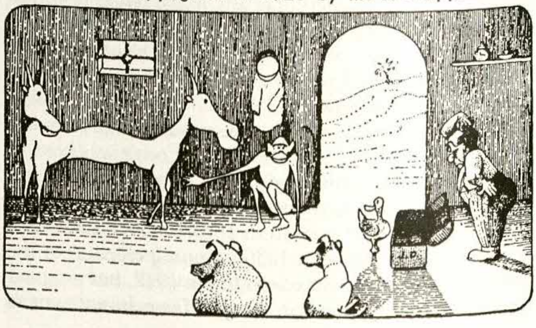
There are some industries on the islands. These include canning, quick-freezing, and processing of fish oil and fish meat. The famous whirlpool known as the Maelstrom is between the islands of Moskenesöy and Vaeröy. The chief ports are Lödingen and Svolvaer.

During the German occupation of Norway in World War II, British and Norwegian commando forces carried out two daring and famous raids against the German garrison on the Lofoten Islands. Oscar Svarlien

LOFTING, HUGH (1886-1947), was the creator of Doctor Dolittle, a well-known character in children's fiction. Lofting first wrote about the doctor in letters to his children during World War I, when he served in the British Army. When *The Story of Doctor Dolittle* was published in 1920, it won such popular favor that Lofting was persuaded to continue the adventures of Doctor Dolittle and his animal friends in *The Voyages of Doctor Dolittle* (1922). He received the Newbery medal for this book in 1923. Lofting later wrote and illustrated a series of Doctor Dolittle books.

Lofting was born in Maidenhead, England, of Irish descent. He spent most of his life in the United States. He studied at the Massachusetts Institute of Technology and at the London Polytechnic, and traveled widely as a civil engineer. Some of his other works include *Porridge Poetry* (1924), *The Twilight of Magic* (1930), and *Story of Mrs. Tubbs* (1937). Lofting died in Los Angeles, Calif. Jean Thomson

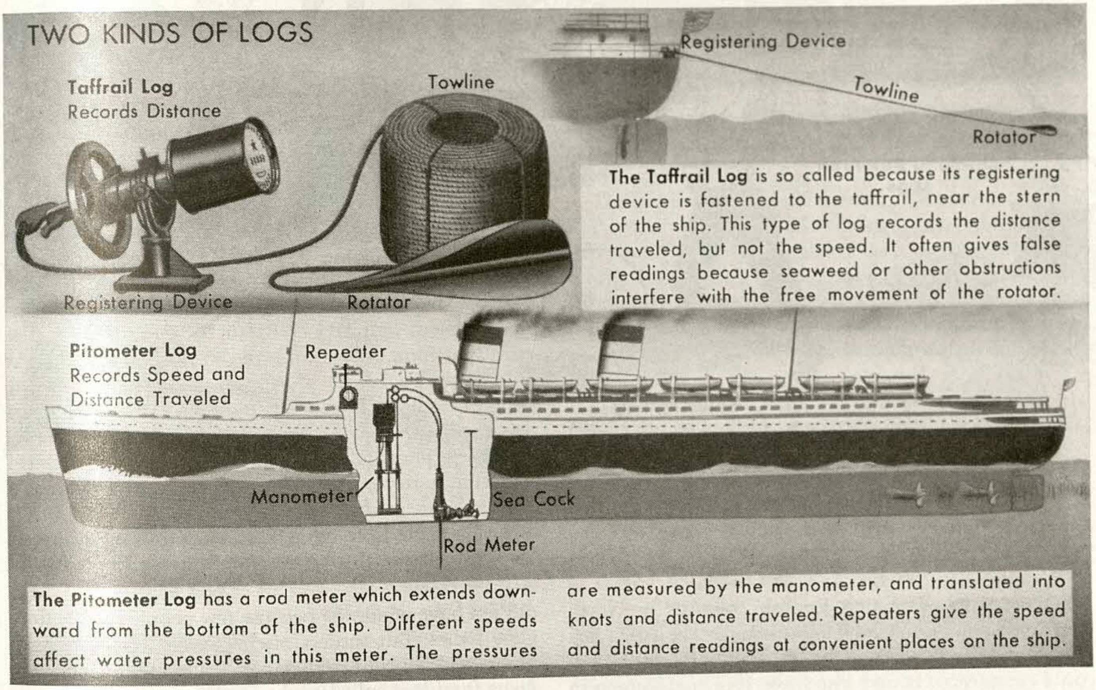
Dr. Dolittle Is Puzzled by the *Pushmi-Pullyu*, a two-headed beast. Chee-Chee the monkey, Dab-Dab the duck, Gub-Gub the pig, and the dog Jip are amazed, too. The illustration was drawn by Hugh Lofting, who also wrote the book *The Story of Dr. Dolittle*, copyrighted in 1920 by the J. B. Lippincott Co.



LOG is an instrument that measures the speed of a ship. The most important kinds are (1) the chip, or common, log; (2) the taffrail log; (3) the harpoon log; (4) the ground log; (5) the Forbes log; and (6) the pitometer log.

The Chip Log is a piece of board about half an inch thick and shaped like a quarter of a circle, about 6 inches long on the two straight sides. The curved edge is weighted with lead so that the log floats upright in the water with the curved edge down. A sailor throws the log into the water behind the ship, and a line attached to it unreels as the ship moves. By noting the amount of line that runs out in a given time, a sailor can determine the speed of the ship.

The Taffrail Log works on the principle of the automobile speedometer. It consists of a rotator with spiral fins that cause it to turn as a ship pulls it through the water. The rotator is connected by means of the towline to a recording device that looks like a clock. The recorder, attached to the stern of the ship, shows only the distance traveled. Because of this, a sailor must make two readings, with a known interval of time between them, to obtain the speed of the ship.



TWO KINDS OF LOGS

The Taffrail Log is so called because its registering device is fastened to the taffrail, near the stern of the ship. This type of log records the distance traveled, but not the speed. It often gives false readings because seaweed or other obstructions interfere with the free movement of the rotator.

The Pitometer Log has a rod meter which extends downward from the bottom of the ship. Different speeds affect water pressures in this meter. The pressures are measured by the manometer, and translated into knots and distance traveled. Repeaters give the speed and distance readings at convenient places on the ship.

The Harpoon Log resembles the taffrail log, but its register is towed in the water with the rotator, and must be hauled in to be read.

The Ground Log is used in shallow water when a ship is moving slowly. It has a lead weight on the end of a lead line. A sailor throws the lead overboard and it sinks to the bottom. A known amount of line is paid out and the time noted, as in the case of the chip log. This method shows not only the speed of the ship, but the direction of the current.

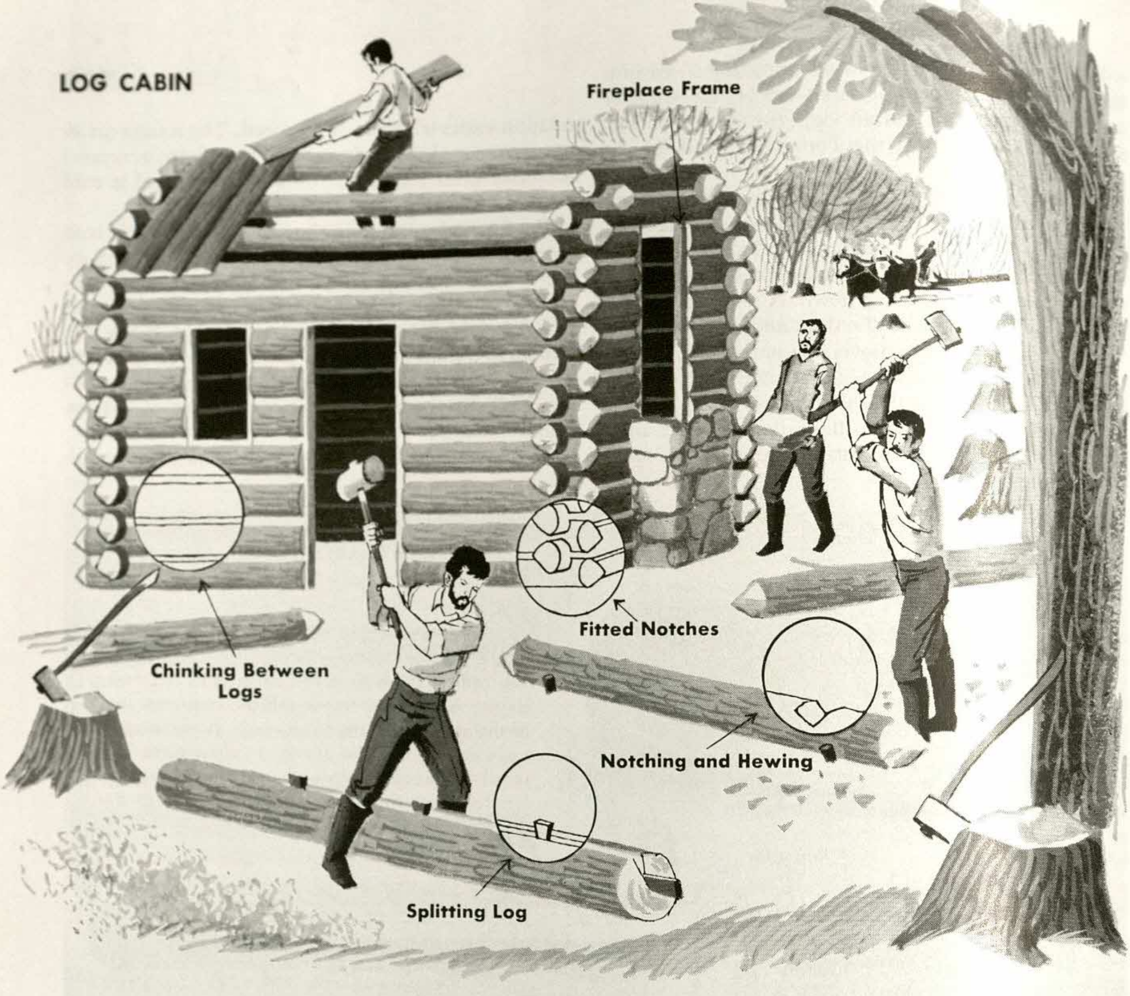
The Forbes Log consists of a small rotator in a tube that projects through the ship's bottom. The speed of rotation varies with the ship's speed. The rotator drives a *magneto*, or electric generator. The voltage generated is measured on voltmeters which are calibrated to read in knots. Thus the speed is read directly.

The Pitometer Log, like the Forbes log, records both speed and distance. But the pitometer log operates by the action of water pressure. The basic part of a pitometer log is a *Pitot tube* that forms part of a *rod meter* that extends between 24 and 30 inches below the bottom of a ship. The Pitot tube has an opening on the side facing the bow of the vessel. Another tube surrounding the Pitot tube has an opening that faces toward one side of the ship.

When the ship is at rest, the water pressure at the opening of the Pitot tube and the surrounding tube is the same. This is known as *static* pressure. As the ship moves, the speed of the vessel increases the water pressure on the opening of the Pitot tube. This is known as *dynamic* pressure. The total pressure on the Pitot tube equals the sum of the static and dynamic pressures. But the opening in the outer tube receives only static pressure, whether the ship is at rest or in motion. Various devices inside the ship measure the differences in pressure between the two tubes and translate this into speed and distance.

Large, modern steamships measure speed by counting the revolutions of the ship's propeller. The accuracy of this method is affected by the weather, the shape of the ship, and the ship's bottom. If the sides and bottom are smooth, one revolution of the propeller can send the ship farther than it can if the sides are uneven or covered with barnacles or seaweed. KENNETH M. SMITH

See also KNOT; LOGBOOK.



American Pioneers Built Log Cabins entirely from the materials available in the wilderness. With their simple tools, they shaped, split, and notched logs to make these sturdy shelters. Log cabins served as both homes and fortresses on the frontier.

LOG CABIN. The first English colonists in North America did not know how to build houses of logs. They lived in shelters made of brush and bark until they could erect frame houses like those they had known in England. But colonists who had lived in the forests of Switzerland, Germany, and Scandinavia knew how to build log houses. Swedish settlers who came to Delaware in 1638 built the first log cabins in America. German pioneers who settled in Pennsylvania built the first log cabins there about 1710. But Scotch-Irish immigrants made the first wide use of logs when they moved to the "back country" of the Appalachian highlands after 1720. By the time of the American Revolutionary War, settlers along the whole western frontier were using log cabins.

The log cabin was not easy to build, although it required few tools. Builders used three types of logs: round, hewn on two sides, or squared. The logs had to be about the same size so that the cracks between them could be easily *chinked*, or filled, with moss, clay, or mud. Builders had to be careful in cutting the notches where the logs fitted together. They usually covered the cabin roof with bark or thatch, and later with rough wooden shingles cut from logs. Most log cabins did not have windows, because few people could afford glass panes. But settlers often covered openings with animal skins or greased paper. They made doors and floors from logs split lengthwise. The door was usually hung on leather hinges. Most log cabins had one story, with one or two rooms. Some had a loft for sleeping and storage, which people could reach with a ladder, or by steps cut into the cabin wall. Later, pioneers erected two-story log houses with several rooms.

Many noted Americans, including Abraham Lincoln, were born in log cabins. To rise from such humble beginnings to become President has long been part of the American dream of equality and opportunity. The log cabin came to symbolize the dream of being able to improve one's place in life. WALKER D. WYMAN

See also COLONIAL LIFE IN AMERICA (Home Life and Customs); PIONEER LIFE (Pioneer Homes).

LOG-CABIN AND HARD-CIDER CAMPAIGN. See HARRISON, WILLIAM H. (Elections of 1836 and 1840).

LOGAN, Indian chief. See OHIO (Famous Ohioans).

LOGAN, Utah (pop. 18,731; alt. 4,500 ft.), lies in the Wasatch Range, about 30 miles northeast of Great Salt Lake. For location, see UTAH (color map). Famed and colorful Logan Canyon stands east of the city. Fur trappers once cached, or hid, their furs for safekeeping near Logan when this region was a wilderness. Today, Logan is the seat of Cache County, "The Granary of Utah." The chief products of Logan are sugar, woolen goods, canned fruits and vegetables, and dairy products. Logan was settled in 1859. It is the home of Utah State University, and of one of four Mormon Temples in Utah. A. R. MORTENSEN

LOGAN, JOHN ALEXANDER (1826-1886), gained fame as a Union general and political leader. After the Civil War, he helped organize the Grand Army of the Republic, a veterans' organization. He is also credited with originating the idea of Memorial Day in 1868.

In 1862, Logan fought in all the Western campaigns under General Ulysses S. Grant. He later distinguished himself at the siege of Vicksburg, Miss., and served with General William T. Sherman on the march through Georgia. Logan became a major general of volunteers and a corps commander. His soldiers called him *Black Jack* because of his dark complexion, eyes, and hair.

Brown Bros.

John A. Logan

Logan served in the U.S. House of Representatives from 1859 to 1862, and again from 1867 to 1871. He then served in the U.S. Senate until 1877, and from 1879 until his death. In 1884, he ran unsuccessfully for Vice-President on the Republican ticket with James G. Blaine.

Logan was born in Jackson County, Illinois, on Feb. 9, 1826. After an interrupted education, he studied law at the University of Louisville and was admitted to the bar. He was a volunteer in the Mexican War, then served in the 1853 and 1857 sessions of the Illinois legislature. Early in the Civil War, he became colonel of an Illinois regiment. T. HARRY WILLIAMS

LOGAN, JOSHUA (1908-), an American playwright, director, and producer, shared a Pulitzer prize in 1950 with Oscar Hammerstein II and Richard Rodgers for the musical play *South Pacific*. Logan also coauthored and directed *Mister Roberts* in 1948. He has directed such plays as *Annie Get Your Gun* (1946), *Picnic* (1953), and *Fanny* (1954). Logan was born in Texarkana, Tex., and attended Princeton University. He began his career as director and actor with the University Players in 1931. GEORGE FREEDLEY

Wide World

Joshua Logan

LOGAN, MOUNT. See MOUNT LOGAN.

LOGAN, STEPHEN TRIGG. See LINCOLN, ABRAHAM (Early Practice).

LOGAN, SIR WILLIAM EDMOND (1798-1875), a Canadian geologist, gained fame for his pioneer work on coal and on very ancient rocks. He was born in Montreal and educated in Scotland. After 23 years in business, he resigned to study coal deposits in Wales. He then returned to Canada and became the first director of the Geological Survey of Canada. His most important book was *A Report on the Geology of Canada* (1869). Logan also supervised Canada's geologic exhibits at several international fairs. CARROLL LANE FENTON

LOGANBERRY is a red berry that grows on a type of trailing blackberry vine in certain sections of the Pacific Coast states and British Columbia. It is named for Judge J. H. Logan, of Santa Cruz, Calif., who first grew the vine in 1881. The berry is considered a form of blackberry.

Loganberries are purplish-red and sometimes are $1\frac{1}{4}$ inches in length. The vines usually grow on a wire trellis from 3 to 4 feet high. The vine tips are planted in layers. Loganberries cannot stand hot, dry weather, or cold temperatures. They have an acid flavor which grows less sharp as the berries become riper. The flavor of loganberries is improved by cooking. Homemakers and commercial food packers prepare the berries in a number of ways. Loganberries can be canned, dried, used in jams, and for their juice.

The berries called phenomenal, youngberry, and boysenberry are something like the loganberry. The boysenberry was first raised in 1935. It is a popular black fruit on the Pacific Coast. It is believed to be a cross of the loganberry, raspberry, and blackberry. None of these fruits is hardy enough to grow in the northern states east of the Rocky Mountains without protection during the winter.

Scientific Classification. Loganberries belong to the family *Rosaceae*. They are genus *Rubus*, species *ursinus*, variety *loganobaccus*. ROY E. MARSHALL

See also BLACKBERRY; BRAMBLE; PLANT (color picture, Fruits Unknown to Our Forefathers).

Lush, Purplish-Red Loganberries, *inset,* **grow in clusters on trailing vines. The berries look much like blackberries.**

USDA; Oregon State College

LOGARITHMS, *LOG uh rith'mz*, are numbers, usually grouped in a table, used to reduce complicated multiplications and divisions to additions and subtractions, and to do other problems.

A logarithm is what is known in algebra as an exponent (see ALGEBRA [Terms Used in Algebra]). The equation $2^3=2\times2\times2=8$ expresses a relationship among the *number* 8, the *base* 2, and the *exponent* 3. This relationship can also be stated another way: 3 is the *logarithm* of the number 8 to the base 2. In general, if $b^x=p$, then by definition x is the logarithm of p to the base b. This can be written briefly as $x=\log_b p$.

The Laws of Logarithms

Because logarithms are exponents, the properties of exponents apply to them. The following equations show some of the important properties of exponents:

(1) $b^x\times b^y=b^{x+y}$ (3) $(b^x)^n=b^{nx}$

(2) $b^x\div b^y=b^{x-y}$ (4) $\sqrt[n]{b^x}=b^{x/n}$

These properties of exponents can be restated in the language of logarithms. To restate the first equation, let $b^x=p$, $b^y=q$, and $b^{x+y}=r$. Then, by the definition of a logarithm, $x=\log_b p$, $y=\log_b q$, and $x+y=\log_b r$. It follows then that $\log_b r=x+y=\log_b p+\log_b q$. But by the first property of exponents, $r=p\times q$. Thus we have $\log_b (p\times q)=\log_b p+\log_b q$. In words, *the logarithm, to the base b, of the product of two numbers is equal to the sum of the logarithms of the two numbers to the base b.*

To restate the second equation in logarithmic language, set $b^{x-y}=s$. Then, $\log_b s=x-y=\log_b p-\log_b q$. But by the second property of exponents, $s=\frac{p}{q}$. Thus, $\log_b(\frac{p}{q})=\log_b p-\log_b q$. In words, *the logarithm, to the base b, of the quotient of two numbers is equal to the logarithm of the numerator to the base b minus the logarithm of the denominator to the base b.*

Next, set $b^{nx}=t$. Then $\log_b t=nx=n\log_b p$. But by the third property of exponents, $t=p^n$. Thus, $\log_b (p^n)=n\log_b p$. In words, *the logarithm, to the base b, of a power of a number is equal to the product of the exponent of the power and the logarithm of the number to the base b.*

Finally, set $b^{x/n}=u$. Then $\log_b u=\frac{x}{n}=\frac{1}{n}\log_b p$. But by the fourth property of exponents, $u=\sqrt[n]{p}$. Thus, $\log_b(\sqrt[n]{p})=\frac{1}{n}\log_b p$. In words, *the logarithm, to the base b, of a root of a number is equal to the quotient of the logarithm of the number to the base b and the index of the root.*

Using Logarithms

Multiplication. To multiply two numbers using logarithms, look up the logarithms of the two numbers in a table. Add these logarithms to get the logarithm of the product of the two numbers. Then, using the tables, find the number whose logarithm is the logarithm of the product. This is the product of the two numbers.

Division. To divide one number by another, look up the logarithms of the two numbers in a table. Subtract the logarithm of the denominator from the logarithm of the numerator. Then, using the table again, find the number whose logarithm is the same as the logarithm found by subtraction. This number is the desired quotient.

Raising a Number to a Power. To raise a number to a power, look up the logarithm of the number in a table. Multiply this logarithm by the exponent of the power. Then, using the table, find the desired power of the given number.

Finding a Root. To find the root of a number, look up the logarithm of the number in a table, and divide this logarithm by the index of the root. Then, using the table again, find the number whose logarithm equals the number found by the preceding division. This is the root of the number. See ROOT; SQUARE ROOT.

Kinds of Logarithms

Common Logarithms. Any positive number, other than 1, can serve as a base for logarithms. However, 10 is the most convenient base because our number system is based on 10. Logarithms to the base 10 are called *common* logarithms.

The common logarithms of two numbers that have the same sequence of digits, such as 247 and 2.47, differ only by an *integer*, or whole number. For example, $247=100\times2.47=10^2\times2.47$. Therefore, $\log_{10} 247=\log_{10} 10^2+\log_{10} 2.47=2+\log_{10} 2.47$. Thus, the common logarithms of 247 and 2.47 differ only by the whole number 2. In fact, to four decimal places, the common logarithm of 247 is 2.3927 and the common logarithm of 2.47 is 0.3927.

Because 247 lies between 100 and 1,000, that is between 10^2 and 10^3, you can expect $\log_{10} 247$ to lie between $\log_{10}10^2$ and $\log_{10}10^3$. That is, the common logarithm of 247 lies somewhere between 2 and 3. Thus, you could determine the whole number part of $\log_{10} 247$ mentally.

In common logarithms, the whole number part is called the *characteristic*, and the decimal part is called the *mantissa*. For a given number, a shift in the position of the decimal point changes the characteristic, but does not change the mantissa. Because you can determine the characteristic mentally, logarithm tables only record mantissas. This is true only of common logarithms.

Natural Logarithms. Although common logarithms serve as the most convenient type for computation, mathematicians have found that natural logarithms are best for theoretical purposes. In the system of natural logarithms, the base is the number $e=2+\frac{1}{2}+\frac{1}{2\times3}+\frac{1}{2\times3\times4}+\ldots=2.71828\ldots$ Natural logarithms are useful in theoretical mathematics because many important formulas in calculus take their simplest possible forms using them.

History

John Napier, a Scottish mathematician, prepared the first published discussion and table of logarithms in 1614, (See NAPIER, JOHN). Jobst Bürgi of Switzerland independently discovered logarithms at about the same time. In the early 1600's, Henry Briggs of England introduced the base 10 and began constructing a 14-place table of common logarithms. Adriaen Vlacq of The Netherlands completed Brigg's work.

About 1622, Edmund Gunter of England conceived the idea of marking equal logarithmic scales on strips and multiplying and dividing by sliding one strip along the other. This idea forms the basis for the slide rule (see SLIDE RULE).

The Briggs-Vlacq tables remained in use until 20-place common logarithm tables were calculated in Great Britain between 1924 and 1949. HOWARD EVES

LOGBOOK is the written record of the events which take place during a ship's voyage. The log may be written up once a day by the captain of the ship, or it may be written by each officer after he completes his watch. It includes a record of the ship's course and speed, the weather, and any ships or lands sighted. It also includes any sickness, death, or crime on board ship, and any other unusual event. See also Log. John J. Floherty

LOGGERHEAD. See Turtle.

LOGGIA. See Architecture (Architectural Terms).

LOGGING. See Lumber (From Forest to Sawmill).

LOGIC is the study of the principles and methods of argumentation. An argument in logic is a set of statements. Some of the statements serve as *premises*, or statements of evidence, and others serve as the *conclusions* that can be drawn from the premises.

Logic studies the forms of arguments and the rules which distinguish those which are *valid*, or correct, from those which are *invalid*, or incorrect. For example, we may validly argue as follows:

All men are mortal.
Socrates is a man.
Socrates is mortal.

But the following argument is invalid:

All weeds are plants.
The flower is a plant.
All weeds are flowers.

The correctness of an argument of the type illustrated depends on its form, not on the actual truth or falseness of the premises.

Kinds of Logic

Logic tells us what would be true if the premises were true. In *deductive logic*, the conclusion is a necessary consequence of the premises. In *inductive logic*, the conclusion is only more or less probable on the basis of the premises.

Deductive Logic. Some rules that describe valid deductive arguments are: (1) If statement A implies statement B, and if B implies C, then A will imply C. For example, if the statement, "It is raining," implies "The ground is wet," and if "The ground is wet" implies "The rivers will be swollen," then "It is raining" implies "The rivers will be swollen." (2) If statement A implies statement B, and if we can show that A is true, then B will also be true. For example, the statement that 6 is an even number implies that 6 is divisible by 2. If we know that 6 is an even number, we can then assert that 6 is divisible by 2. (3) If statement A implies statement B, and if we can show that B is false, then we know A is false also. For example, the statement is made that "Today is Wednesday." This implies that tomorrow is Thursday. If we know that tomorrow is not Thursday, then we can infer that today is not Wednesday.

The most common type of argument form in deductive logic is the *syllogism*. A syllogism consists of two premises and a conclusion made up of statements of the following forms: All A is B, some A is B, some A is not B, and no A is B. The rules for a valid syllogism include: (1) A syllogism must have exactly three terms. For example, a person gives the syllogism: "All laws are made by Congress. $V = at$ is a law of falling bodies. Therefore, $v = at$ was made by Congress." This syllogism is invalid because the word *law* is *ambiguous*, or obscure. *Law* can mean a physical law, such as the law of falling bodies. Or it can mean a legislative law. Therefore, this syllogism contains four terms instead of three. (2) Two negative premises yield no conclusion. (3) Two positive premises yield a positive conclusion. (4) From a positive and a negative premise, only a negative conclusion follows. For example, "All fish do not live on land. Some turtles live on land. Therefore, some turtles are not fish." (5) The term that occurs in both premises must be modified by the words *all* or *none* at least once. For example, "All books printed in 1660 are valuable. These books were printed in 1660. Therefore, these books must be valuable." This is a valid syllogism because the form is correct, although the first premise is not necessarily true. (6) A term that occurs in the conclusion modified by *all* or *none* must also be modified by *all* or *none* in the premises.

Aristotle, the famous Greek philosopher, first developed the syllogism. On the whole, his formulation of it has remained unchanged. Often called "The Father of Logic," he taught that the syllogism was the main instrument for reaching scientific conclusions.

Inductive Logic. Conclusions are based upon premises, so logic also studies the grounds for belief. This part of logic is called *inductive logic*. For example, a person might infer from the statement, "All men are courageous, and courageous men are gentle," the conclusion that "All men are gentle." One could then logically ask, "What are the grounds for your belief that all men are courageous?"

Grounds for belief may be based on generalizations, analogies, or causal connections. Scientific experimentation is a way of controlling observations in order to secure reliable grounds for belief. Experiments may be set up to test each of the grounds for belief.

A person may observe the planet Mars in a number of positions in the sky and infer that it is moving in an elliptical path. This is a *generalization*, or a general principle which makes an assertion about all members of a class of objects. See Generalization.

A person may argue that student A is good at mathematics because he is like student B in temperament. He argues using an *analogy*, or a comparison of two or more things which agree in some respects.

A person may observe that he gets restless as the temperature rises. He may then draw the conclusion that the heat makes him restless. He is arguing from a *causal connection*, or from cause and effect.

Symbolic Logic

In recent years, students of logic have begun to use symbols instead of words to stand for logical units. The result is called *symbolic logic*. *Logicians*, or scholars who study logic, have used symbolic logic in order to make deductive logic a purely mechanical procedure like mathematics. Symbolic logic has extended the knowledge of logic a great deal.

Symbolic logic works in this manner: Instead of writing, "If A is true and A implies B, then B is true," a logician writes "$A\ (A \rightarrow B) \rightarrow B$." The $\rightarrow$ means *implies*, or *if*——— *then*———.

Instead of writing "All men are courageous," the logician writes "$(x)\ (Mx \rightarrow Cx)$." The symbol (x) means *for all x*, the symbol Mx means *x is a man*, and Cx means x is courageous. This brings out the meaning of "All men are courageous." But the proof that John, who is a man, is courageous, takes this form: $(x)\,(Mx \rightarrow Cx)$ and Mj (John is a man) $\rightarrow Cj$. The rule states that we can replace the variable x by a constant in the form $(x)\,(Mx \rightarrow Cx)$ and $Mj \rightarrow Cj$.

LOUIS O. KATTSOFF

See also ARGUMENT; DEDUCTIVE METHOD; FALLACY; INDUCTIVE METHOD; REASON.

LOGISTICS, *loh JISS tiks,* is the science of providing and maintaining men, equipment, and supplies for military operations. The term originally came from the Greek word *logistikos*, meaning *skilled in calculating*. Its modern meaning more closely follows the French word *loger*, *to house* (or *lodge*). Baron Antoine Henri de Jomini, a Swiss authority on warfare in the 1800's, probably introduced the word to modern usage. He called logistics one of the most vital parts of war.

Modern armies armed with complex weapons and equipment require tremendous logistical effort to put them into battle and keep them there. For example, almost half of the total strength of the United States Army in World War II had to provide logistic support for the other half that came in direct contact with the enemy. One of every four men in a combat division performed duties related to logistics, including supply and administration.

The extraordinary task of supplying an army can be imagined by comparing the amounts of artillery ammunition fired in World War I and in the American Civil War. During one average month of World War I, the British and French armies fired more than twice as much artillery ammunition as did the Union army during the entire four years of the Civil War.

Supply forms only one part of the task of logistics. Military forces must be moved from place to place. They must arrive in the right strength at the right place at the right time with the right weapons and equipment. They must have lodging. Records on the fighting forces must be kept. Weapons and equipment must be designed, tested, and produced. Food must be cooked and packaged. The sick and wounded must be cared for.

On land and in the air, chemical, engineer, medical, ordnance, quartermaster, signal, and transportation units provide logistic support for combat units. Service forces at sea composed of cargo ships, hospital ships, icebreakers, minelayers, oilers, repair ships, transports, and tugs provide this support to the warships of the fighting fleets.

CHARLES B. MACDONALD

See also QUARTERMASTER.

LOGOGRAPH. See WRITING (symbols).

LOGOS. See HERACLITUS.

LOGROLLING is the trading of votes as commonly practiced in legislative bodies. One party or group in a legislature may want to pass a bill in which it is vitally interested. Another party or group may want to pass a different bill. Each group may have little or no interest in the other's project. But each group, in turn, votes for the other's bill in order to obtain support for its own bill. A common case of logrolling arises in connection with approving appropriations for local improvements.

WILLIAM G. CARLETON

LOGWOOD comes from the hard, middle part of a tropical tree which belongs to the pea family. It is called logwood because it is shipped to market in logs weighing about 900 pounds. The tree grows in Mexico, Central America, and some parts of the West Indies.

Logwood is heavy and firm-textured. Its natural color is blood-red, but it turns black after it has been out in the air for a long period. The coloring matter in the wood is used to make many dyes. The blood-red color turns lighter when acids are added, and darker when alkalies are added. The dye from logwood is still used for coloring silk and woolen goods, but coal-tar dyes are taking its place. Logwood also is used in the manufacture of ink.

Scientific Classification. Logwood belongs to the family *Leguminosae*. It is genus *Haematoxylon*, species *campechianum*.

HAROLD NORMAN MOLDENKE

See also BELIZE.

LOHENGRIN. See OPERA (Some of the Famous Operas).

LOIRE, *lwahr,* **RIVER,** about 650 miles long, is the longest river in France, and drains about a fourth of the country. For location, see FRANCE (color map). It rises in the Cévennes Mountains, about 4,500 feet above sea level, and flows northward to Orleans. At Orleans, the river turns westward and flows through a beautiful valley with many famous châteaux. It empties into the Bay of Biscay in western France. Boats find it difficult to navigate on the Loire because of occasional floods and many sandbanks. The wide mouth of the river at Saint-Nazaire has been deepened by dredging from Nantes to the sea. Canals connect the Loire with the Saône, Rhône, and Seine rivers. The Loire's most important tributaries are the Allier, Cher, Indre, Maine, and Vienne rivers. The Romans called the Loire the *Liger*.

JACK R. VILLMOW

LOKI, *LOH kee,* was the troublemaker among the gods of Norse mythology. Although born into a family of giants who warred with the gods, he became Odin's

Loki's Wife Catches the Poison Dripping from a serpent's jaws as Loki lies helpless, chained to the rocks.

Historical Pictures

foster brother and was accepted among the gods. He was handsome, but cunning and wicked. Loki appears often in Norse legends. He helped the gods with their problems, but he also caused them a great deal of trouble and taunted them.

His worst deed was to cause the death of Balder the Beautiful, the favorite son of the goddess Frigg. As punishment, he was chained to a rock with a snake hung over him. The snake dripped poison on his head. Norse legend says Loki must remain chained there until the end of the world, when he will break loose and fight with the giants against the gods. Einar Haugen

See also Balder; Mythology (The Death of Balder); Frigg; Thor.

LOLLARDS were originally a religious group of the early 1300's in Holland. Their mission was to help the sick and bury the dead. About 1387 the term began to be used in England as a name for the followers of Wycliffe. People nicknamed these men "Poor Priests." They wore long russet gowns and carried staffs, and went about the small villages of England. They preached simplicity of worship and denounced the Mass, Papal authority, and other basic doctrines of the Catholic faith. Oxford was their headquarters.

They were most numerous in southern England, though they also spread into Scotland. Henry IV, who came to the throne in 1399, had declared himself their enemy. Under him and Arundel, the Archbishop of Canterbury, they were persecuted so severely that they were threatened with complete destruction. The leaders were imprisoned and tortured. Many of them were burned at the stake or executed when they refused to give up their beliefs. But the sect continued to exist for another hundred years or more. Many of their beliefs were the same as those that Luther later adopted. In this way, the Lollards helped to pave the way for the Reformation. Albert Beebe White

See also Wycliffe, John.

LOMBARD was the name of a tribe related to the Germans. The tribe's original home was on the lower Elbe. In the years A.D. 1 to 100, the Lombards fought their way southward and eastward until they came to the Roman border on the Danube River. During the 500's, they invaded and conquered Pannonia and then the northern part of Italy, which still bears the name of Lombardy. In the 700's, the Lombard kingdom reached its greatest power and prosperity. Because the Lombards had become Roman Catholics, even the pope was friendly to them.

Peace did not last long between the Lombards and the dukes of Italy. The pope became alarmed at the extent of their conquests, and asked the Frankish king to help him. The Lombards were defeated, and peace was preserved until 774, when Charlemagne sent back his wife, the daughter of the Lombard king, Desiderius. The Lombards were defeated again in the war that followed. In 803, Charlemagne crowned himself with the Iron Crown of Lombardy. William Scott Ferguson

See also Charlemagne; Crown; Frank; Lombardy.

LOMBARD, PETER (1100?-1160), wrote one of the first theological textbooks, the famous *Four Books of Sentences*, completed by 1152. A compiler of genius, he assembled past and current conflicting opinions on theological problems in an orderly, methodical way. He then used traditional doctrine to resolve the conflicts. The *Sentences* remained a standard textbook for 400 years, and many famous scholars commented on it. Lombard was born near Novara in Lombardy. After studying in Bologna and Reims, he taught at the cathedral school in Paris. He became bishop of Paris in 1159. James A. Corbett and Fulton J. Sheen

LOMBARD LEAGUE. See Frederick I.

LOMBARDO, GUY. See Popular Music (Dance Music).

LOMBARDY (pop. 6,880,000) is a region in northern Italy. It is named for the Lombards, a tribe which once lived there. It is a densely populated area of 9,186 square miles, including the provinces of Bergamo, Brescia, Como, Cremona, Mantua, Milan, Pavia, Sondrio, and Varese. Lombardy is the most important industrial region in Italy. It produces great quantities of wine, silk, and cheese. Lombardy poplar trees are named for this section of Italy. Benjamin Webb Wheeler

Italian State Tourist Office

Lombardy, Italy's foremost industrial and agricultural area, lies in rolling lowlands in the northern part of the country.

See also Lombard.

LOMBOK. See Indonesia (Islands).

LOMBROSO, CESARE. See Criminology.

LOMÉ, *law MAY* (pop. 30,100), is the capital and chief seaport of Togo, an independent republic in West Africa. Lomé is connected by railroad with the inland cities of Togo. For location, see Africa (color map).

Most of the people of Lomé are Negroes. Their chief industries include woodworking, pottery making, weaving, and trading. Lomé has a natural harbor from which timber, rubber, cocoa, palm oil, coffee, and other products are shipped to European ports. Alan P. Merriam

LOMOND, LOCH. See Loch Lomond.

LONDON

The River Thames is one of the most famous rivers in the world. It carries barge traffic through the heart of London.

Big Ben, the largest bell in the Clock Tower of the Houses of Parliament, strikes the hours. A light in the tower at night shows that Parliament is meeting.

Grant, Black Star; Ewing Galloway

LONDON, *LUN dun* (pop. 3,273,000; met. area, 10,450,000; alt. 245 ft.), is the capital of the United Kingdom of Great Britain and Northern Ireland. It is also the political center of the British Commonwealth of Nations. London ranks as the largest city in Great Britain and the ninth largest in the world. It has the world's second largest metropolitan area. Only New York City has a larger metropolitan area.

Huge gray limestone buildings line most of the streets of London. Green parks, attractive red brick houses, and small tree-filled squares add touches of color to many parts of the city. Narrow streets, winding alleys, and broad avenues crisscross the crowded central area.

The streets and buildings of London are linked with exciting scenes in English literature and drama. They have been settings for the plays of Shakespeare and for detective stories about Sherlock Holmes. The teeming streets and busy docks have also been the scenes of many historic acts, such as the execution of King Charles I in 1649. Some of the world's greatest leaders have lived in London.

The city has survived wars, plagues, and fires for nearly 2,000 years. German bombs destroyed some of the oldest and most historic buildings during World War II. Parts of the city had to be rebuilt. But most of the famous landmarks still stand.

Ships from every land sail to and from the Port of London, one of the busiest ports in the world. The city is a world center of trade, commerce, and finance. London also holds a leading position in government, law, journalism, medicine, music, sports, the theater, and other fields of activity.

London lies on the River Thames, near the coast of southeastern England. Greater London, the metropolitan area, covers about 690 square miles. It includes the entire counties of London and Middlesex, and covers parts of four other counties. Suburbs surround the city in a wide circle.

Trafalgar Square is often considered the center of London. Distances are usually measured from Charing Cross, a point at the south edge of Trafalgar Square. The main residential and business areas extend for about 15 miles in every direction from Charing Cross.

Diplomats, businessmen, and tourists from every country visit London. Certain parts of the city are headquarters for diplomats from foreign lands. Refugees crowd into other districts. But, besides being a world center, London is a very British city. It emphasizes the deep feeling that many Britons have for permanence, privacy, and property.

London from the Air

If you flew over London in a helicopter, you could look down on the broad River Thames winding eastward through the heart of the city. You would see the river curve toward the north and then turn to the east. A band of parks extends west from the bend in the river.

Most of the famous tourist attractions lie within an area of four or five square miles around this bend. This part of London is divided into two areas, *The City* and *the West End*. You can find The City easily from the air by locating the dome of Saint Paul's Cathedral. Two landmarks, Buckingham Palace and the Houses of Parliament, help you find the West End.

The West End is London's social, entertainment, and government center. The most important government offices stand in a group in an area called *Westminster*. This area lies between the band of parks and the bend in the river. Nearby are theaters, fashionable shops, and fine homes in the district called *Mayfair*.

The City is the business and judicial center, covering only one square mile. A group of buildings called *the Temple* rises at the southwestern corner of The City. The grim Tower of London stands at the southeastern corner.

Stone, smoke, and rain help give London its special character. Many buildings are made of white limestone from Portland, a small island off the southern coast of England. Clouds of smoke from thousands of chimneys thicken the fogs that often hang over London, and tons of soot have fallen on the buildings through the years. The white limestone quickly turns dark gray or black.

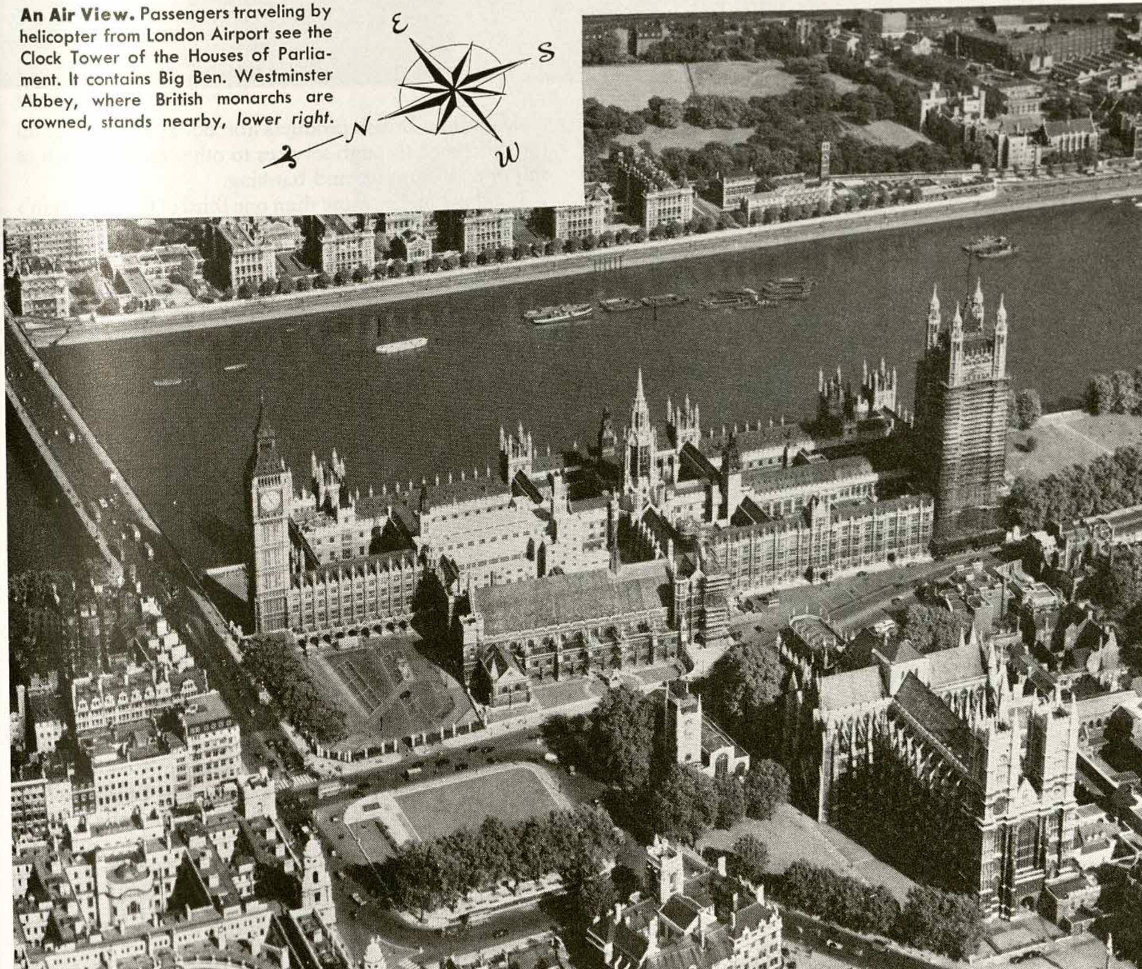
Life of the People

The People. Visitors often call all Londoners *Cockneys*. But, to the British, a true Cockney is one born within the sound of "Bow bells," the bells of Saint Mary-le-Bow Church, in the heart of London. The name *Cockney* is also used for the dialect many Londoners speak. The people often put an *h* in words that begin with a vowel, and leave out the *h* at the beginning of other words. They may say *Hoxford* instead of *Oxford*, and *Ampsted Eeth* instead of *Hampstead Heath*. See COCKNEY.

Many London names are not pronounced the way they are spelled. For example, the names of two squares, Berkeley and Grosvenor, are pronounced *BAHRK lih* and *GROHV ner*. And two districts to the south of The City, Southwark and Dulwich, are called *SUTH erk* and *DUHL ij*.

London is famous for the colorful dress of the red-coated guards at Buckingham Palace and the blue-uniformed bobbies who patrol the streets. Important businessmen and bankers in The City wear formal coats, striped black trousers, and bowler hats. They carry tightly-rolled umbrellas. Some London costumes are ancient, like the uniforms yeoman warders wear in the Tower of London. These uniforms were first made in the 1550's. But shops in the West End specialize in the latest fashion styles.

For recreation, Londoners and visitors go to the many parks that dot the area. The people enjoy horseback riding on Rotten Row, one of the lanes in Hyde Park. Children and their nursemaids often spend the



Aerofilms, Ewing Galloway

An Air View. Passengers traveling by helicopter from London Airport see the Clock Tower of the Houses of Parliament. It contains Big Ben. Westminster Abbey, where British monarchs are crowned, stands nearby, *lower right.*

Gullers, Pix

Piccadilly Circus is the center of the theater district, and one of the shopping centers of the West End.

London Bobbies, or policemen, spend much of their time helping visitors find their way in the crowded streets.

Karl Gullers

day in Kensington Gardens, to the west of Hyde Park. A famous statue of Peter Pan stands in the Gardens (see PETER PAN [picture]). Regent's Park, to the north of Hyde Park, has the Zoological Gardens, one of the largest zoos in the world. Hyde Park and Regent's Park have lakes for boating. Wimbledon Common, to the southwest of central London, is the scene of international tennis matches. Important cricket matches take place at Lord's Cricket Grounds, west of Regent's Park, and at Kennington Oval, south of Lambeth Palace.

Parks outside central London include Richmond Park, to the southwest; Hampstead Heath, to the north; and Epping Forest, to the northeast. Londoners often make short trips to Windsor Castle and Eton College, west of the city, or to resorts on the nearby seashore.

Restaurants in The City usually serve plain English boiled or roasted foods (see ENGLAND [Way of Life]). Restaurants in the West End feature French, Italian, Greek, and other special kinds of cooking.

The Suburbs extend in all directions from central London. They have some tourist attractions, such as the Royal Botanic Gardens in Kew, the zoo in Whipsnade, and airports at Hanwell, Heathrow, and Northolt. But many persons who visit London never see the miles and miles of streets lined with dwellings that make up most of the suburbs. Here the people live in small brick houses. Often two families live in two-part houses called *semidetached villas*. Most homes have gardens.

Trade. London is the most important port in Great Britain and the chief center of British commerce. The country spends more money importing goods than it makes selling British products abroad. It must make up the difference through services to other nations, such as shipping, insurance, and banking.

London handles more than one third of Great Britain's overseas trade. British ships also carry goods for many other countries. A number of insurance companies, such as Lloyd's, were set up to insure ships against disaster and to handle other shipping problems. London banks are centers for world-wide loans and bond issues, and serve as international currency exchange agencies.

Industry. Many British industries have headquarters in London. Most of the clothing, furniture, and precision instruments made in Great Britain come from London factories. London printers do a large part of the country's printing. London processes nearly all its own foods and drinks. Large industries have grown up in the suburbs, including motion-picture studios and automobile plants. The London area also processes tobacco and refines metals. Most London industries are small, and almost all are privately owned.

Transportation. British railroads extend in all directions from London. Eight major passenger stations, including Charing Cross, Paddington, and Waterloo, serve the area.

Greater London has an elaborate subway system, "the Tube," that is fast, comfortable, and convenient. The subway was begun in 1863 and has been steadily extended and improved. It cuts through a thick layer of clay beneath the whole London area. Some stations are 200 feet below the surface of the ground. Passengers reach them by elevators and escalators.

Thousands of red double-decked buses also serve London. The London Transport Executive, a government agency, manages all the transportation systems except taxicabs and the main rail lines. London Airport, the main airline terminal, is at Heathrow, west of the city. Croydon Airport, to the south, was built in 1915.

Education. London has many elementary and secondary schools, both public and private. Special schools offer trade and technical training, and education in the arts. Most of these schools receive government aid.

A special feature of the educational system is its adult education program. Men and women attend whatever classes may interest or benefit them. The courses are taught in their own neighborhoods.

London was once the home of many famous private schools of the type called *public schools* in England (see ENGLAND [Education]). Most of these schools moved into various country towns, but one of the oldest, Westminster School, still stands in London.

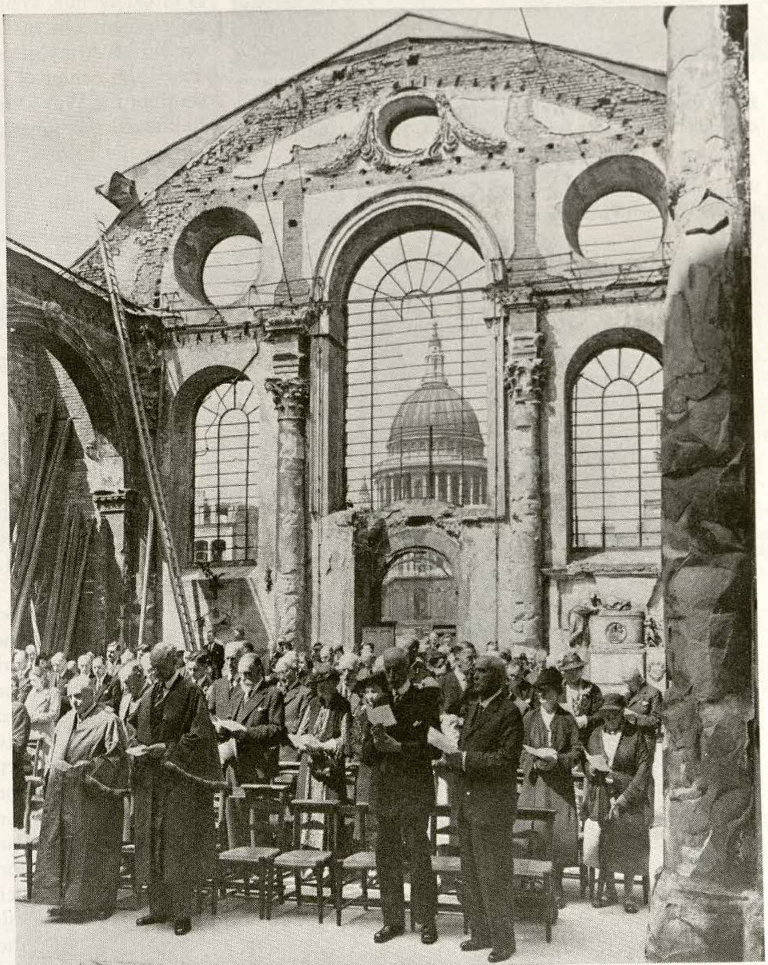
The University of London, in the Bloomsbury district, is one of the world's greatest centers of learning. It includes many famous schools, including the London School of Economics (see LONDON, UNIVERSITY OF).

Churches. London has churches of all faiths. One of the most famous places of worship is Saint Paul's Cathedral. It is the largest cathedral of the Church of England in London. The original church was destroyed in the Great Fire of 1666. Sir Christopher Wren designed and built the present church. Westminster Abbey was once part of a monastery. Famous Englishmen lie buried beneath the Abbey floor. Many beautiful churches were damaged during World War II. London also has a Buddhist temple and a Moslem mosque.

Libraries and Museums. London has many art galleries and other museums. The British Museum, near the University of London, houses a magnificent collection of books and ancient objects of art. The National Gallery, the Tate Gallery, and the Wallace Collection have fine collections of world-famous paintings. London also has specialized collections such as the National Portrait Gallery. Kensington, west of London's main business section, is the home of the Science Museum, the Natural History Museum, and the Victoria and Albert Museum. A popular tourist attraction, Madame Tussaud's, near Regent's Park, has wax models of famous persons and a model chamber of horrors.

The Arts. London is the greatest artistic center of Great Britain, and one of the most important in the

British Information Services



Saint Mary-le-Bow Church is often considered the heart of London. Children born within the sound of Bow bells are considered *Cockneys,* or true Londoners. Only the tower and walls withstood an air raid in World War II.

Cash, Rapho-Guillumette

Saint Martin-in-the-Fields was completed in 1726. It replaced an earlier church that was built on the same site about 1222.

Saint Paul's Cathedral took 35 years to build, from 1675 to 1710. Old Saint Paul's burned during the Great Fire of London.

Miller, Black Star

world. Five major symphony orchestras perform in London: the Royal Philharmonic, the London Philharmonic, the London Symphony, the Philharmonia Orchestra, and the British Broadcasting Corporation (BBC) Symphony Orchestra. Large-scale concerts are presented in Royal Albert Hall and in Royal Festival Hall. Smaller concerts and recitals are given in Wigmore Hall.

British dramatists have written for the London stage since before the time of Shakespeare. Most theaters are fairly small, and the audiences have a feeling of taking part in the action on the stage. The Hippodrome and the Palladium present musical revues.

Persons in other lands may never have seen London. But they know the names of its streets, railroad stations, and parks from reading the works of such authors as Charles Dickens, Oliver Goldsmith, Samuel Johnson, Charles Lamb, H. G. Wells, and Virginia Woolf.

Famous Landmarks

Trafalgar Square and Whitehall. Trafalgar Square is considered the heart of London. It is named for Admiral Lord Horatio Nelson's great naval victory over France in 1805. A giant statue of Nelson stands atop a tall column in the center of the square.

Important streets branch out from Trafalgar Square. A broad avenue, Whitehall, leads south past important government offices. The War Office, headquarters of the British Army, rises east of Whitehall. New Scotland Yard, the center of police work in Great Britain, lies south of the War Office. Along the west side of Whitehall stand the Treasury and the Admiralty, headquarters of the British Navy. Around the corner from the Treasury, on narrow Downing Street, stands a simple red brick building—Number 10—that serves as the official home of the Prime Minister.

Parliament Square lies at the south end of Whitehall. To the east of the square, along the riverbank, government leaders debate important issues in the Houses of Parliament. Big Ben, the famous bell in the Clock Tower of the Houses of Parliament, booms out the hours. Westminster Abbey stands just west of the Houses of Parliament.

Buckingham Palace lies within walking distance from Parliament Square, near the end of Birdcage Walk. The walk forms the south edge of Saint James's Park. Green Park stretches north of the palace. A broad tree-lined avenue, the Mall, separates the two parks. It forms the north edge of Saint James's Park, and passes south of Saint James's Palace. The Mall passes under Admiralty Arch into Trafalgar Square.

Piccadilly Circus and Mayfair. To the west of Trafalgar Square is Haymarket, center of the theater district. Haymarket extends northward to an open paved area called Piccadilly Circus. The area near Piccadilly Circus serves as a link between daytime shopping areas and the gay evening entertainment area. Several important streets meet here. One of them, Piccadilly, runs westward through a fashionable shopping area. It forms the north side of Green Park and ends at Hyde Park Corner, a landmark famous for its open-air forum. Anyone who wants to make a speech can climb up on a box at Hyde Park Corner and address the people passing by. He can even denounce the royal family, as long as he does not disturb the peace. From Piccadilly, Park Lane runs

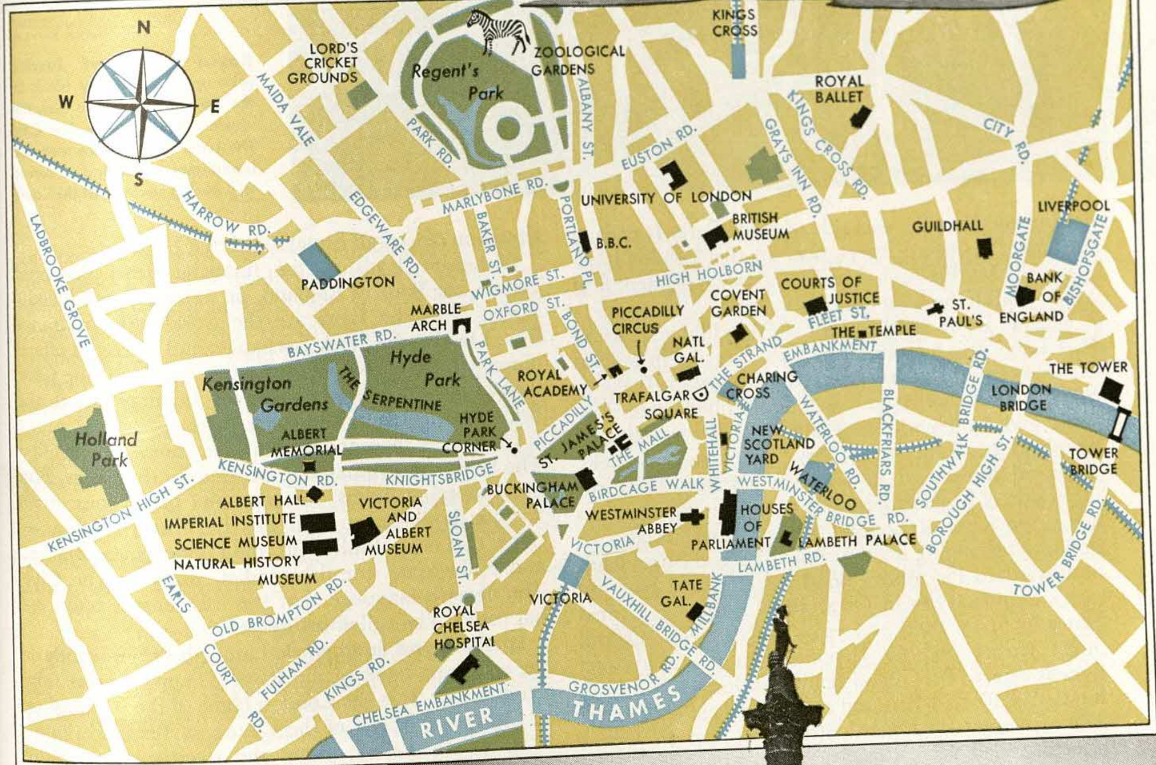
FAMOUS PLACES IN LONDON

THE MARBLE ARCH

Two important through streets, Oxford Street and Park Lane, meet at this London landmark, northeast corner of Hyde Park.

MAP OF INNER LONDON

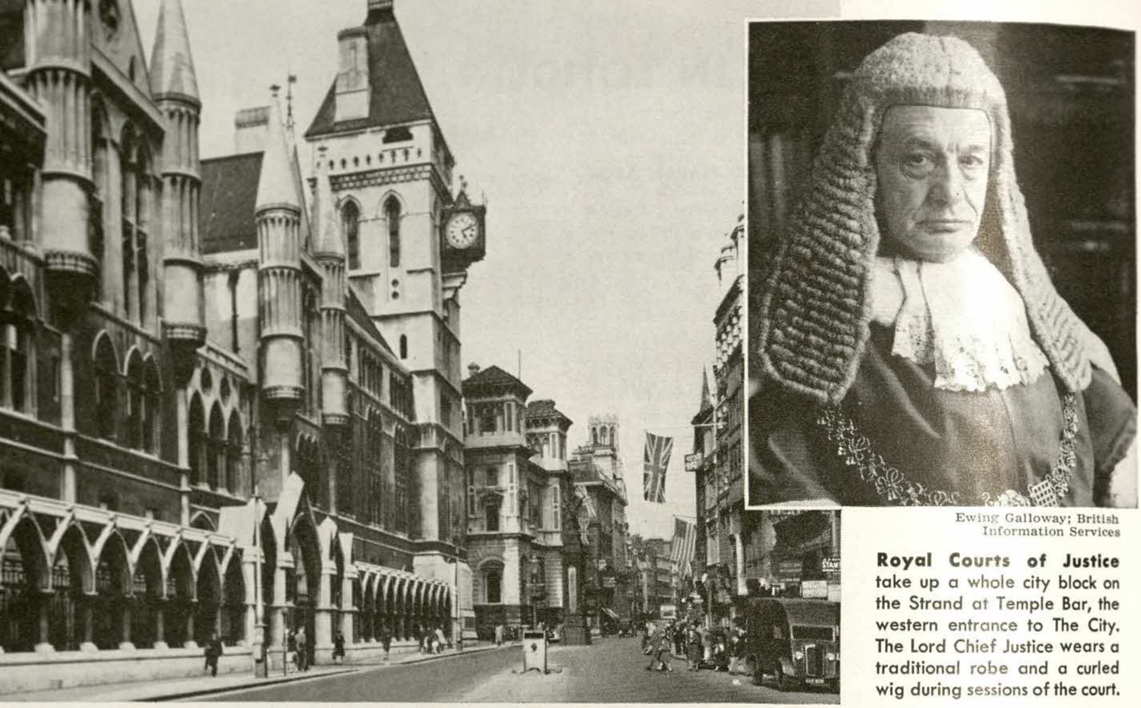
The Thames (shown in blue) winds eastward through London to the North Sea. Public parks (shown in green) dot the city. Important buildings are shown in black, and railroad stations are shown in blue. The names of roads and streets are in blue.



TRAFALGAR SQUARE

A huge statue of Admiral Horatio Nelson towers over the center of London. The buildings in the background include the domed National Gallery of Art and the Church of Saint Martin-in-the-Fields.

Ewing Galloway; Gendreau



Ewing Galloway; British Information Services

Royal Courts of Justice take up a whole city block on the Strand at Temple Bar, the western entrance to The City. The Lord Chief Justice wears a traditional robe and a curled wig during sessions of the court.

northward along the east side of Hyde Park. It ends at the corner of Oxford Street, near another London landmark, the Marble Arch. London housewives often meet at the Marble Arch for a shopping trip.

Mayfair is the district north of Piccadilly and east of Park Lane. It is famous for its embassies and important business offices. Landmarks in Mayfair include Berkeley Square; Grosvenor Square, with the United States Embassy and a memorial to Franklin D. Roosevelt; and Shepherd Market, where *May fairs* were once held.

Oxford Street and its connecting streets along the north side of Mayfair form one of the few direct routes across the heart of London. Oxford Street is also an important shopping district. From it, Bond Street leads southward to Piccadilly. Bond Street tailors have set men's fashion styles in Great Britain and the United States for more than 100 years. Farther east, Oxford Street crosses another important shopping avenue, Regent Street. This broad boulevard leads south from Regent's Park and Portland Place to Piccadilly Circus. The area south of Oxford Street and east of Regent Street is called *Soho*. It has been a favorite residence for London's foreign-born people since French Huguenots flocked there in the late 1600's. Northeast of this district is another famous region, *Bloomsbury*, the home of the British Museum and the University of London.

The City. Oxford Street and a connecting route, High Holborn, continue east into the oldest part of London, The City. Another important avenue, the Strand, runs eastward to The City from Trafalgar Square. Temple Bar, the western entrance to The City, stands between the Courts of Justice and *the Temple*, a group of buildings that has been a center for lawyers for hundreds of years. Within The City, the Strand is called Fleet Street. Here are the main offices of London's great newspapers, such as *The Times* and *The Daily Mail*. The road continues up Ludgate Hill to Saint Paul's Cathedral. Behind the cathedral is Cheapside, a continuation of Oxford Street and High Holborn.

Cheapside leads to the financial heart of Great Britain, the Bank of England, on narrow Threadneedle Street. Near the Bank are the world-wide insurance firm, Lloyd's; the Stock Exchange; and the main offices of many large banks. In the eastern corner of The City, *yeoman warders* in the Tower of London guard the British crown jewels and other treasures.

Only a few thousand people have homes in The City. The land is too valuable to be used for dwellings. But, every morning, trains, subways, and buses pour about 500,000 businessmen into this busy area of finance, trade, and news. Smithfield, the London meat market, and Billingsgate, the fish market, stand in The City. The abusive language that the fishmongers often use has come to be called *billingsgate*.

Lambeth and Southwark. Lambeth Palace stands on the southeast bank of the River Thames, across from Westminster. It is the London home of the Archbishop of Canterbury, head of the Church of England. North of Lambeth Palace, along the riverbank, are Saint Thomas's Hospital and the London County Hall. Waterloo Station, the largest railroad station in Great Britain, stands east of the hall. Near it, on Waterloo Road, is a famous theater, the Old Vic.

Southwark is one of the oldest districts in London. Its name comes from the *south works*, or fortifications, that protected London Bridge from attack in the Middle Ages. Southwark Cathedral stands at the south end of London Bridge. It contains a chapel dedicated to John Harvard, founder of Harvard University. Saint George's Inn, on Borough High Street, is the only ancient Southwark inn that still has a medieval atmosphere. Tabard Inn stood nearby. It was founded in 1307 and was torn down in the 1870's. Tabard Inn was the starting place for the pilgrims in Chaucer's *Canterbury Tales*.

Bridges cross the River Thames at many points in the London area. Tower Bridge, with its twin towers

New Scotland Yard is the home of the London Metropolitan Police. The headquarters got its name because its offices were on the site of a palace owned by the kings of Scotland. The land was considered part of Scotland, not England, until the two kingdoms were united in 1707.

Sawders

and covered walkway, is the easternmost bridge across the Thames. London Bridge, to the west, stands near the site of the first bridge in the London area. Other famous bridges include Westminster Bridge, near the Houses of Parliament, and Blackfriars Bridge.

The Port of London lies east of London Bridge. The basin just below the bridge is called *the Pool*. Docks, wharves and warehouses extend eastward for 25 miles to Tilbury. Ships enter the docks at high tide and dock gates are closed behind them, keeping the water in as the tide runs out. More than 40,000 ships enter the port every year. The Port of London Authority has charge of 70 miles of tidal river, 720 acres of water in the docks, and 45 miles of wharves.

Government

The City, the County of London, and areas around the county all have separate governmental units. Many Londoners feel that their system of government is too complicated. But they believe that it serves them well.

The City is governed by the Lord Mayor of London and the Corporation of the City of London, made up of a Board of Aldermen and a Common Council. The people elect the council, and the council elects the Lord Mayor. The City preserves many ancient ceremonies connected with its government. The monarch must stop at Temple Bar before entering The City on state occasions. The City also has its own police force.

The London County Council (L.C.C.) controls an area of 117 square miles around The City. This area is divided into 28 boroughs, each with its own elected mayor and council. One borough, Westminster, is a city in itself. Borough councils work with the L.C.C. to build public bridges, hospitals, housing projects, parks, roads, and schools. The L.C.C. operates the fire department and the sewer system.

Greater London. About half the people of Greater London live under 80 other local governments in the area outside the control of the L.C.C. Special organizations handle problems that all the communities share. For example, the Metropolitan Water Board supplies water to the whole area from springs, wells, and the River Thames. London's famous *bobbies* patrol the area outside The City. Their name comes from Sir Robert Peel, who founded the Metropolitan Police in 1829.

History

The early Britons learned that they could cross the River Thames at low tide near what is now Westminster. When the Romans conquered Britain in A.D. 43, they built a bridge at this point and unloaded cargoes on the higher ground north of the river. They gave the name *Londinium* to the settlement near the bridge.

As the years passed, the people built walls around their little town. They also built a forum with temples and public baths. Six Roman roads started in, or passed through, Londinium. One of the most famous is Watling Street. The Romans used the town as their chief port.

Londinium lost importance after the Romans left in the early 400's. The walls fell down or were destroyed by invading armies. But the city slowly came to life again under the Saxons in the 700's. King Alfred the Great rebuilt the Roman fortifications around the city in the late 800's. With this protection, the city prospered.

Medieval London became an important commercial center during the 200 years after Alfred rebuilt the city walls. Merchants set up shops within the walls, where they could be safe from attack. As they grew in numbers and in wealth, the merchants wanted to govern themselves. They felt that the kings hampered their trade with too many restrictions. When the Normans conquered England in 1066, William the Conqueror granted The City certain *liberties*, or privileges of self-government. But he also built the White Tower, now the center of the Tower of London, as a fort to dominate The City. Troops from the tower put down riots.

Ewing Galloway; British Travel Assn.

Tower Bridge, *top right,* spans the Thames near the Tower of London. William the Conqueror built the White Tower, *top left,* as a palace, storehouse, and prison.

Beefeaters, or Yeoman Warders, were once the king's bodyguards. Now they guide tourists in the Tower of London.

Old Saint Paul's Cathedral was begun in 1087 and completed about 200 years later. It was the largest Gothic church in England. London Bridge was finished in 1209. It was built of stone, and had a drawbridge in the center and fortified gates at each end. It was the only bridge across the Thames near London until 1750. Londoners built walls in Southwark to protect the bridge.

King John gave The City a charter in 1215, granting it the right to govern itself. The charter provided for a Board of Aldermen and an elected mayor. The first mayor had been elected in the 1190's. After about 100 years, his title became Lord Mayor of London.

Charing Cross was a real cross in the 1290's. King Edward I ordered crosses set up at each place where his wife's funeral procession stopped. Charing Cross, the last of these, became an important landmark near Westminster. By the 1400's, about 50,000 people lived in *the city within the walls*, the area now called *The City.* Charing Cross and Westminster became the centers of *the city without* (outside) *the walls*, or the West End. The Palace of Westminster became the center of the king's court, Parliament, and the *exchequer*, or royal treasury.

In Shakespeare's Time, during the late 1500's, about 200,000 people lived in London. King Henry VIII built Saint James's Palace in the West End. Other important developments took place in The City and in the port area to the east. Goldsmiths in The City began to practice banking as they furnished money for expanding commerce. Merchants developed the harbor and sent trading ships into the Baltic and Mediterranean seas. In the 1600's, the merchants formed trading companies. Groups such as the East India Company, the Virginia Company, and the Hudson's Bay Company explored and developed new lands across the seas.

London demanded entertainment, but the Lord Mayor disapproved of the theaters, which had just become popular. Producers such as James Burbage built round or square courtyards in which to stage new plays. Theaters appeared in areas north and south of The City, just outside the Lord Mayor's control. William Shakespeare's theater, the Globe, stood across the river from The City (see SHAKESPEARE, WILLIAM [picture, Stage and Theater]).

War, Plague, and Fire struck London one after the other in the middle 1600's. A growing struggle between King Charles I and Parliament led to civil war in 1642. London instantly sided with Parliament, led by Oliver Cromwell, because it had often suffered at the hands of King Charles. The king was beheaded in Whitehall in 1649, and The City supported parliamentary government. But it accepted Charles II when he became king in 1660 (see RESTORATION).

A terrible epidemic of the *bubonic plague* attacked London in 1665. At that time, no part of the city had adequate sewers. The people dumped garbage and other filth into small streams, such as the Fleet and the Tybourne, that flowed into the River Thames. Sometimes they threw garbage into the streets. During the plague, the dead and dying lay crowded together in the narrow streets and lanes. Thousands of people died within a few months.

In 1666, the Great Fire of London broke out. Flames roared through wooden houses and buildings for almost a week, leaving four fifths of The City in ashes. The fire destroyed most buildings within the walls, including Old Saint Paul's Cathedral and the Guildhall, council-chamber of the government of The City.

Sir Christopher Wren made plans to rebuild The City, designing broad avenues and wide squares. He rebuilt many churches, including Saint Mary-le-Bow, and put up monuments such as Temple Bar. His most famous work is Saint Paul's Cathedral, with its magnificent dome. Wren also built the Royal Observatory at Greenwich. In rebuilding London, officials banned the use of wood and required builders to use stone or brick.

In the 1700's and 1800's, London continued to grow steadily. About 500,000 people lived in The City and nearby regions in 1700. As The City grew, the people tore down parts of the old walls around it to make more room. In 1750, engineers completed Westminster Bridge, the second bridge across the Thames in the London area. The Bank of England, founded in 1694, attracted more trade to The City. The Stock Exchange was founded in 1773. Men who insured ships often met at Lloyd's coffeehouse. They set up their own headquarters in 1774.

Industries sprang up quickly in the London area during the Industrial Revolution, beginning in the middle 1700's. London quickly became one large workshop. Shipping, banking, and insurance thrived with the development of industry. By 1800, London had more than 1,000,000 people, and was the world's largest city.

In the 1820's, engineers feared that London Bridge was ready to fall down, as a nursery rhyme had promised for hundreds of years. They completed a new bridge in 1831, and tore the old bridge down the next year. In 1834, a fire destroyed Westminster Palace. The Houses of Parliament were built on the site in 1840.

Railroads began to provide fast transportation in the middle 1800's, and London became the rail center of Great Britain. New suburbs formed a ring of little towns around The City and the West End. The London County Council was set up in 1888 to govern the newly-created County of London.

The 1900's. Attacks from the air brought London a new threat during World War I. German dirigibles dropped some bombs, but they caused little damage compared to the air raids of World War II.

The Germans turned to Great Britain in the summer of 1940, after the fall of France. They planned to destroy the country from the air, beginning with London. German planes began making daylight raids on London in September. But the Royal Air Force beat off the daylight attacks, and forced the Germans to attack at night. The entire country was blacked out, and Londoners took refuge in air-raid shelters and subway stations. Night after night, German raiders dropped fire bombs to light the way for waves of heavy bombers dropping high explosives. Bomb craters, unexploded bombs, and fallen walls slowed rescue work and blocked traffic. The worst fires broke out in The City, where most buildings were locked and empty at night. Fires raged throughout whole blocks north and east of Saint Paul's Cathedral.

London losses included the Guildhall, gutted in "the Second Great Fire of London" on December 29, 1940. The House of Commons was destroyed during a raid on May 10, 1941. The churches of Saint Mary-le-Bow and Saint Clement Danes lay in ruins. Bombs also hit Westminster Abbey and Saint Paul's Cathedral, and some fell near Buckingham Palace. German bombs destroyed or damaged seven of every nine houses in London.

Londoners turned on their lights again when the war in Europe ended on May 8, 1945. They quickly set about rebuilding their city. Bombed-out buildings were torn down and many sites became parking lots. New buildings replaced old ones. When the people held a Festival of Britain in 1951, London was the chief attraction. Planners chose a large area on the south bank of the Thames, across from Charing Cross Station, as the festival site. A permanent Royal Festival Hall was put up. Later, part of the festival site was used for London's air terminal.

In March, 1955, an American firm opened a new hotel in the Mayfair district. It was the first new hotel built in London in 20 years. Later that year, engineers announced plans to dam the Thames below London, giving the city a tide-free port. In 1956, plans were announced for the building of a 26-story block of office buildings and cultural centers, on the south bank of the River Thames.

FREDERICK G. MARCHAM

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Anglo-Saxon
Bank of England
Bedlam
Big Ben
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British Museum
Bubonic Plague
Clearinghouse
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Great Britain (History)
Inns of Court
Lloyd's
London, University of
London Bridge
Parliament
Port (table)
Saint James's Palace
Thames, River
Tower of London
Trafalgar
Westminster Abbey
Westminster Hall
Westminster School
World War II (The Battle of Britain)
Wren, Sir Christopher

Outline

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Questions

How does London compare in size with New York City? With Chicago?

Why is London considered "a very British city"?

What kind of housing is typical of London?

How does London help Great Britain achieve a balance of trade with other countries?

Why is London considered a great artistic center?

Why are the names of London streets and parks familiar to many persons in other lands?

What is *Piccadilly Circus? The Tube?*

Why do few people live in The City?

How is Hyde Park Corner an example of the British love for freedom?

London Chamber of Commerce

Downtown London, Ont., *above,* has many tree-lined boulevards. The Arts Building at the University of Western Ontario, *left,* has a tower similar to that of Magdalen College, Oxford.

LONDON, Ont. (pop. 101,693; met. area, 154,453; alt. 809 ft.), is the manufacturing, distributing, and financial center of the southwest part of Ontario. Over 500,000 people live within a 50-mile radius of the city. London stands on the Thames River 115 miles southwest of Toronto and 23 miles north of Lake Erie (see ONTARIO [color map]). Named for London, England, it has many of the same historic names as that city.

Industries of London include breweries, iron and brass foundries, tanneries, and shoe factories. Plants in the city also make biscuits, breakfast foods, candy, and diesel locomotives. Several Canadian life insurance and trust companies have their main offices there. London is a distributing center for the products of the rich farm land of the region.

London has a theater and music center, and is the home of the University of Western Ontario. It is the seat of both an Anglican and a Roman Catholic diocese.

John Graves Simcoe, first lieutenant-governor of Upper Canada (now Ontario), thought in the 1790's that he might locate his capital at the site of London. The plan did not carry through, and the first settlers did not arrive until the 1820's. A disastrous fire almost completely destroyed the city in 1845, but it was soon rebuilt. It has a mayor-council government. D. M. L. FARR

LONDON, JACK (1876-1916), was an American novelist and short-story writer. He became an early spokesman for the philosophy of "the survival of the fittest." His vigorous life as longshoreman, sailor in the Pacific, wanderer, gold hunter in Alaska, and war correspondent during the Russo-Japanese War helped to make his writing colorful and authentic.

Jack London

Brown Bros.

His Writings. *The Call of the Wild* (1903), London's best-known novel, shows how, in the Alaskan wilderness, a gentle dog gradually reverts to the ways of his wolf ancestors in order to survive. This story reflected evolutionary ideas then current. It symbolizes London's belief that man also had the capacity to return to his brute beginnings.

While London often praised ruthless individualism, he was also interested in the socialist movement. He demonstrated his socialist ideas in the *War of the Classes* (1905).

London was obsessed with brutal violence in almost every aspect. About the time of the Russian Revolution in 1917, the Russians read more of London than any other American author, and their image of Americans may have been influenced by him.

The literary theories underlying his writing appear in essays such as "The Phenomena of Literary Evolution" and "The Terrible and Tragic in Fiction." *Martin Eden* (1909) is a novel that records London's struggles to learn the art of writing. In this book, he tells of the discouragements that beset him in getting an audience in the Victorian society with its genteel tastes. London pioneered in creating a taste for "men with the bark on," and for red-blooded heroes. As a stylist, he stuck to simple, elemental effects focused on a stirring climax.

Among his 50 books are *Son of the Wolf* (1900), *A Daughter of the Snows* (1902), *People of the Abyss* (1903), *White Fang* (1905), *Before Adam* (1906), *Revolution and Other Essays* (1910), and *The Abysmal Brute* (1913). London also wrote *The Mutiny of the Elsinore* (1914) and *On the Makaoloa Mat* (1919).

His Early Life. London was born in San Francisco. He worked at odd jobs after he finished grammar school. He says he occasionally robbed nets left overnight by other fishermen to catch oysters, and sold the oysters early in the morning at the market. He lived for a time as a tramp, riding underneath freight cars. He studied furiously and prepared himself to enter the University of California, but left after a semester. HARRY H. CLARK

LONDON, TOWER OF. See TOWER OF LONDON.

LONDON, TREATIES OF. Throughout history, many international treaties have been signed in London. Some of the more important of these agreements are described below.

The Treaty of 1913 was an attempt to end the first Balkan War. Delegates from Greece, Serbia, Bulgaria, and their enemy, Turkey, signed it on May 30, 1913. The defeated Turks were allowed to keep a small European foothold in eastern Thrace. Greece received

Salonika, southern Macedonia, and Crete. Serbia gained central and northern Macedonia, and Bulgaria took western Thrace and the northern coast of the Aegean Sea. The treaty caused new conflicts. On June 29, 1913, Bulgaria attacked Greece and Serbia, and the second Balkan War began. See BALKANS (The First Balkan War).

The Treaty of 1915 was a secret treaty signed by Great Britain, France, Russia, and Italy. In return for entering World War I against Germany, Italy was promised the southern Tyrol, northern Dalmatia, Istria, and Gorizia. See WORLD WAR I (The Italian Front).

The Treaty of 1930 became known as the London Naval Treaty. On April 22, 1930, the United States, France, the British Empire, Italy, and Japan signed the pact to limit and reduce naval armaments. Previous treaties had dealt with limitations on battleships, aircraft carriers, and heavy cruisers. The 1930 treaty tried to place limitations on light cruisers, destroyers, and submarines. The treaty allowed the United States, Great Britain, and Japan to increase warship production if another power increased its naval production. France and Italy did not sign part of the treaty.

The Treaty of 1936 reaffirmed the naval treaty of 1930. The United States, France, and Great Britain signed it on March 25, 1936. STEFAN T. POSSONY

LONDON, UNIVERSITY OF, is a coeducational institution made up of several colleges and institutes of higher education located in the London area. The university includes 9 institutes; 4 theological schools; 13 undergraduate medical and dental schools; 14 medical institutes and the Postgraduate Medical School of London, which make up the British Postgraduate Medical Federation; 14 colleges; and 18 affiliated colleges. The university also has the London School of Hygiene and Tropical Medicine, and the Lister Institute of Preventive Medicine. The average enrollment is over 22,000. There are also over 24,000 "external" students, registered in the affiliated colleges. The university was founded in 1836. R. W. MORRIS

LONDON BRIDGE. See GAME (Games for Young Children).

LONDON BRIDGE is the most famous bridge in London. It is 928 feet long and 63 feet wide, and rests on five granite arches. It is one of 14 bridges across the River Thames. Vehicles and pedestrians use it. It was built between 1823 and 1831.

The present London Bridge replaced a stone bridge built in 1205, about 100 feet farther downstream. The stone bridge stood on the site of an earlier wooden bridge. Houses lined both sides of the stone bridge, and the heads of executed traitors sometimes hung over the entrance. It was the only bridge over the Thames until 1750, and the words of the song, "London Bridge is falling down," were true. Repairs kept it in use until it was torn down in 1832. FRANCIS H. HERRICK

See also LONDON (color map).

LONDON COMPANY was an association of "noblemen, gentlemen, and merchants." In 1606, the association was granted a charter by King James I of England for settlement in North America. It founded the Jamestown colony in 1607.

The founders of the London Company believed that precious metals existed in the Americas. They spent about $10,000 to send three groups of emigrants to America. By 1608, the company threatened that if the colony did not make money, the colonists should be "left in Virginia as damaged men." Two new charters, one in 1609, one in 1612, reorganized the company, but it still failed to make a profit.

King James had no sympathy for the hardships of the colonists, the swampland, the malaria, the bad drinking water, and the raids of hostile Indians. In 1623, the king told the company that it was mismanaging things. He took over the association in 1624, and the London Company was dissolved. G. G. DODDS

See also JAMESTOWN (Va.); VIRGINIA (History).

LONDON NAVAL TREATY. See LONDON, TREATIES OF (The Treaty of 1930).

LONDONDERRY, *LUN dun DER ih* (pop. 50,000), is the second largest city in Northern Ireland. This important seaport lies 64 miles northwest of Belfast. For location, see NORTHERN IRELAND (map).

The city is on a hill overlooking the Foyle River. The mile-long wall of Londonderry, built in 1609, is the most complete city wall in the British Isles. Modern

Camera Press, Pix

London Bridge stands near the site of the first bridge to cross the River Thames in the London area. The present granite structure, completed in 1831, replaced the famous Old London Bridge, which had been built of stone in 1205.

Londonderry, however, has spread far beyond the wall. Its chief industries include brewing, tanning, and linen making. The wide mouth of the Foyle River gives Londonderry an excellent harbor. The city is a center of sea trade with Great Britain and with other coastal cities of Northern Ireland. FRANCIS H. HERRICK

LONDONDERRY AIR is a famous Irish folk tune. It was first heard in the county of Londonderry. Little is known of its history. But it is believed to have first been a love song.

The Londonderry Air is known under several names. It was first known as "Irish Tune from County Derry." Frederic Weatherly (1848-1929), an English song writer, wrote its most popular lyric, "Danny Boy." Another set of verses, "Would God I Were the Tender Apple Blossom," was written by Katherine Tynan Hinkson (1861-1931).

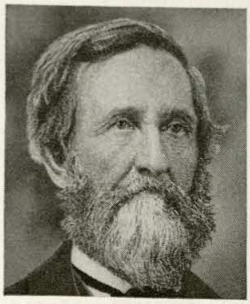
The Londonderry Air has been arranged for string orchestra by Percy Grainger, a well-known pianist and composer. It also has been transcribed for violin by Fritz Kreisler. RAYMOND KENDALL

LONE EAGLE. See LINDBERGH, CHARLES AUGUSTUS.

LONE SCOUT. See BOY SCOUTS (Rural Scouting).

LONE STAR STATE. See TEXAS.

LONG, CRAWFORD WILLIAMSON (1815-1878), was the first doctor to use ether as an anesthetic in surgery. The anesthetic power of ether had been demonstrated at "ether frolics," during which people took small amounts of ether to experience its strange effects. Long also had experimented with its effects on himself. On March 30, 1842, he gave ether to a patient and painlessly removed a tumor of the neck. He did not announce his experiment at the time, and it received no professional or general publicity. Long himself remained unaware of the full value of anesthesia in surgery, although he continued to make occasional use of ether anesthesia. Finally, in 1849, he published a description of his experiments.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Crawford W. Long

Meanwhile, in 1846, William T. G. Morton, a Boston dentist, used ether on a patient before extracting a tooth. This had been done at the suggestion of Charles T. Jackson, a Boston chemist. Long, Morton, and Jackson all claimed credit for the discovery of ether anesthesia. This led to "the great ether controversy," but most historians now give the credit to Long.

Long was born on Nov. 1, 1815, at Danielsville, Ga. He attended the University of Pennsylvania, and practiced at Jefferson and Athens, Ga. CAROLINE A. CHANDLER

See also ANESTHESIA; ETHER; MORTON, WILLIAM T. G.

LONG, HUEY PIERCE (1893-1935), nicknamed the *Kingfish*, was an American politician. His critics accused him of wanting to become dictator of the United States.

Long was born in northern Louisiana and studied law at the University of Oklahoma and Tulane University. He entered politics as a railroad commissioner in Louisiana in 1918. He rapidly rose to power as an opponent of rate increases and the oil companies. In 1928 he was elected governor of Louisiana. He was elected United States Senator in 1930, and entered the Senate in 1932, when his term as governor expired. He was said to have achieved almost complete control of the Louisiana state government.

United Press Int.

Huey P. Long

Long, a Democrat, helped Franklin D. Roosevelt obtain the presidential nomination in 1932, but he came to oppose the policies of the President. He started the "Share-Our-Wealth" movement in 1934, and was gaining a national following when he was assassinated at Baton Rouge, La. GEORGE M. WALLER

See also LOUISIANA (History).

LONG, JANE. See TEXAS (Famous Texans).

LONG, RUSSELL BILLIU. See LOUISIANA (Famous Louisianians).

LONG, STEPHEN H. See FORT SMITH; WESTWARD MOVEMENT (Exploration).

LONG BEACH, Calif. (pop. 344,168; alt. 35 ft.), is a seaport, tourist resort, and manufacturing city in southern California. It stretches for about nine miles along the shore of San Pedro Bay, 20 miles southeast of Los Angeles (see CALIFORNIA [map]).

Ten miles of breakwater protect the Long Beach harbor. Income from city-owned oil wells helps maintain the port as one of the world's most modern and best equipped. Long Beach ranks as one of the largest fishing ports in the world. The U.S. Navy maintains a naval base and shipyard at Long Beach.

Long Beach has over 100 hotels, a fact that helps draw many conventions to it. Most are held at the ocean-front municipal auditorium. The Miss Universe Beauty Pageant was held in the auditorium in the 1950's. The Pike, which lies west of the auditorium, is a major amusement center.

Shipyards and fish canneries line parts of the water front. Oil refining is another important industry. Signal Hill, which borders Long Beach on the north, is one of the world's largest oil fields. Other products of the area include aircraft, automobiles, builders' supplies, chemicals, clothing, concrete products, food products, gypsum, oil-well equipment, roofing materials, rubber products, soaps, and steel products.

Railroads, buses, steamship lines, and airlines serve Long Beach. The Long Beach Air Force Base uses the municipally owned airport.

Long Beach has about 60 public schools, and several private and special ones. It also is the home of Long Beach State College.

Long Beach was founded in the late 1880's, and received a city charter in 1907. It adopted a council-manager government in 1921. A major earthquake on March 10, 1933, killed about 60 people, and caused about $40,000,000 worth of property damage. Long Beach was a busy shipbuilding and oil-distribution center during World War II. GEORGE SHAFTEL

LONG BEACH STATE COLLEGE is a state coeducational school at Long Beach, Calif. It has divisions of arts and languages; education and psychology, health, physical education, and recreation; natural science; and social science. The college grants A.B., B.S., and M.A. degrees. The college was founded in 1949 by the state legislature. For enrollment, see Universities (table).

LONG DIVISION. See Division.

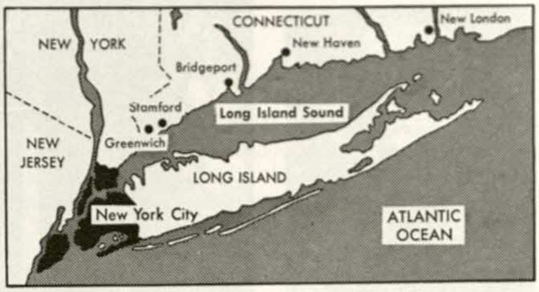
LONG ISLAND, N.Y. (pop. 6,403,852), is an island that forms the southeastern part of New York. It covers 1⅓ times the area of Rhode Island, and has a greater population than that of 43 of the 50 states. The island consists of crowded urban areas, smaller residential towns, fishing villages, and resort centers. The urban areas form part of metropolitan New York. Well-known beaches, including Rockaway, Long, and Jones, lie on Long Island facing the Atlantic Ocean.

Location and Size. Long Island extends eastward from the mouth of the Hudson River for about 120 miles. For location, see New York (color map). It varies in width from 12 to 23 miles, and covers a total area of 1,628 square miles. Long Island Sound separates the island from Connecticut on the north. The Atlantic Ocean lies to the east and south. On the west, Long Island is separated from Manhattan by the East River, from New Jersey by Upper New York Bay, and from Staten Island by the Narrows.

The Counties. Long Island consists of Kings, Queens, Nassau, and Suffolk counties. Kings County, or Brooklyn, and Queens County form part of New York City. Kings County, the largest county in the state, has a population of 2,627,319. Queens County has 1,809,578 residents. Nassau County lies just east of Kings and Queens. It has a population of 1,300,171. Suffolk County occupies the eastern two thirds of Long Island, and has a population of 666,784.

Nassau County once served largely as a residential area for people working in New York City. It now has its own industry and commerce. Industries include airplane plants, electronics factories, and plastics plants.

One of Long Island's Famous Mansions, the Theodore Roosevelt home at Oyster Bay, has been made into a public shrine.
Wide World



Location of Long Island and Long Island Sound

Suffolk County doubled in population between 1950 and 1960. But, because of its size, it will not be crowded for many years. The Brookhaven Laboratory, in Suffolk County, serves as a center for research in nuclear energy. But farms and resorts take up most of the county (see Duck [Duck Farming]). Nassau and Suffolk counties offer sailing, fishing, and swimming.

History. The explorer Henry Hudson discovered Long Island in 1609. He found Algonkian Indians living in small villages. During the 1600's, the Dutch settled the western end of the island, and New Englanders settled the eastern part. The original Dutch name for Long Island was *Lange Eylandt.* One of the most important battles of the Revolutionary War, the Battle of Long Island, took place in present-day Brooklyn on Aug. 27, 1776. The British defeated the Americans, but the colonial troops escaped capture. On the night of August 29, General George Washington took advantage of a heavy mist to retreat to Manhattan. William E. Young

See also Long Island Sound; New York City.

LONG ISLAND, BATTLE OF. See Revolutionary War in America (table, Major Battles).

LONG ISLAND CENTER is a coeducational teachers college at Stony Brook, N.Y. Founded in 1957, it is part of the State University of New York. Besides offering courses in liberal arts, it trains teachers in science, mathematics, nursing, and business. Courses lead to bachelor's and master's degrees. For enrollment, see Universities and Colleges (table).

LONG ISLAND SOUND is a busy waterway that extends southwestward between Connecticut and Long Island. This arm of the Atlantic Ocean is nearly 110 miles long and about 20 miles wide at most points. The East River connects it with New York Bay. The Housatonic, Connecticut, and Thames rivers of Connecticut empty into Long Island Sound. William E. Young

LONG ISLAND UNIVERSITY is a coeducational New York school. It includes Brooklyn Center, with colleges of liberal arts and sciences, and a graduate school; the Brooklyn College of Pharmacy; and the C. W. Post College at Brookville. Another division of the university is Mitchel College, with branches at Fort Hamilton in Brooklyn, the U.S. Naval Hospital at St. Albans, and Suffolk County Air Force Base. Mitchel College was the first college of a civilian university to be located on an American military installation. Long Island University was founded in 1926. For enrollment, see Universities and Colleges (table). Leonard Karlin

Henry W. Longfellow lived most of his life in Cambridge, Mass., in the Craigie House, *right*, on Brattle Street.

Brown Bros.; Gendreau

LONG PARLIAMENT lasted without a break from 1640 to 1653. It was not formally dissolved until 1660. The Long Parliament opened with a direct conflict with King Charles I, met during the Civil War, ordered the king's execution, tried to rule in the uneasy years after the war, and was finally dissolved to make way for a new parliament under King Charles II.

In its early sessions, the Long Parliament made many lasting political reforms. It abolished the hated court of the Star Chamber, where men were tortured for confessions and tried without a jury. It declared that the king could not collect money without its consent, or dissolve parliament without its consent. It also brought about the execution of Charles's chief advisers, the Earl of Strafford and Archbishop William Laud.

On religious questions, the Long Parliament was seriously divided. Presbyterians opposed Puritans, and neither side would budge. Civil war began when the king's supporters withdrew from parliament, and the House soon became divided into Presbyterians, who were moderate royalists, and Independents, who were republican in sympathy. The army, under Oliver Cromwell, supported the Independents. In 1648, a detachment under Colonel Thomas Pride kept the Presbyterian majority from entering the House. "Pride's Purge" resulted in what was called "the Rump Parliament," a minority of about 50 extremists. This remainder of the Long Parliament carried out the execution of Charles I and made England a Commonwealth.

Cromwell, the real power in the commonwealth, found that the Rump Parliament was determined to hold onto its power. He suppressed it in 1653, leaving England without any representative legislature. But the people tired of Puritan dictatorship. The Long Parliament met again in 1660 and called elections. Charles II took the throne soon afterward.

W. M. SOUTHGATE

Related Articles in WORLD BOOK include:

Charles (I) of England
Cromwell, Oliver
England (The Civil War)
Restoration
Rump Parliament
Self-Denying Ordinance
Star Chamber

LONG TON. See TON.

LONGBOW. See ARCHERY (picture).

LONGERON. See AIRPLANE (Body).

LONGEVITY, or **LENGTH OF LIFE.** See LIFE.

LONGFELLOW, HENRY WADSWORTH (1807-1882), was the most influential American poet of his day. He enjoyed great popularity during his lifetime, and did much to determine the American idea of poetry. He was greatly gifted both as a writer of lyrical verse and as a narrative poet. He was also an outstanding scholar and a distinguished professor.

Early Life. Longfellow was born in Portland, Me., on Feb. 27, 1807. On his mother's side, he was descended from John Alden and Priscilla Mullens, about whom he later wrote. The events described in *The Courtship of Miles Standish* were family legends. His father, Stephen Longfellow, was a Harvard graduate and a prosperous lawyer. He was a trustee of Bowdoin College, and at one time a member of Congress. Longfellow's mother, Zilpah Wadsworth, was a lover of nature, music, and poetry.

Longfellow entered Bowdoin College when he was not quite 15, and proved to be a brilliant student. After graduation, at the age of 18, he went to Europe to prepare himself for a professorship of modern languages and literature. He taught at Bowdoin from 1829 to 1834, and then went to Harvard University as Smith professor of literature. Before assuming his duties, he again went abroad for further study.

During this second journey, his first wife, Mary Storer Potter, whom he had married in 1831, died. In Switzerland, Longfellow met and fell in love with Frances Appleton of Boston. But she did not consent to marry him until 1843. They had six children—two boys, Charles and Ernest, the three girls of whom he writes in "The Children's Hour":

> Grave Alice and laughing Allegra,
> And Edith with golden hair,

and another girl, Fanny, who died in infancy. Mrs. Longfellow was a brilliant and beautiful woman whose journals and letters have only recently been published. She had a great influence upon her husband and made him very happy. Their life together came to a tragic end in 1861, when she died in a fire.

Major Works. An excellent linguist, Longfellow pioneered in teaching techniques and helped establish the modern languages as an important part of American education. In his 17 years at Harvard, he gained an outstanding reputation as a professor. He retired from teaching in 1854 to give all his time to literature. The next year he published *The Song of Hiawatha*, an important poem about an Indian hero. He wrote it in an unusual four-footed trochaic measure he took from the Finnish epic, *Kalevala*.

Evangeline, the first long poem in American literature, had appeared in 1847. *The Courtship of Miles Standish* followed in 1858 and the *Tales of a Wayside Inn* in 1863, 1872, and 1874. These were all tremendously successful. But the public cared little for Longfellow's most ambitious work, *Christus: A Mystery* (1872). The three sections of this long poem were *The Divine Tragedy*, *The Golden Legend*, and *The New England Tragedies*. In this work, he tried to depict Christianity in ancient, medieval, and modern times. He left the great fragment, *Michael Angelo*, to appear after his death.

Prose Works. Longfellow also wrote prose. *Outre-Mer* (1833), which came out of his first stay in Europe, shows the influence of Washington Irving's *Sketch Book*. *Hyperion* (1839), a disorganized kind of novel filled with German legends, became one of the great books of the Romantic movement and was long used as a guidebook by European travelers. *Kavanagh* is a story of New England village life.

Longfellow's most important single achievement as a scholar was his translation in 1867 of Dante's *Divine Comedy*, to which he turned for refuge after the second Mrs. Longfellow's death. In a gigantic anthology, *The Poets and Poetry of Europe* (1854), he tried to introduce American readers to many world writers.

Craigie House. Longfellow lived most of his life in Cambridge, Mass., at the Craigie House on Brattle Street. It had once been George Washington's headquarters. Longfellow took a room there when he first went to Harvard. It was there that he brought his second wife, and there that they both died. The second Mrs. Longfellow's father bought the house and presented it to the Longfellows early in their married life. Today, it is a Longfellow shrine, open to the public every day in the year, with all the principal rooms just as they were when Longfellow and his second wife used them.

Place in Literature. Longfellow's long narrative poems are outstanding contributions to American literature, and many of his shorter poems are among the most widely read in the English language. He was the first American poet to receive recognition in other countries. A bust of him stands in the Poet's Corner in Great Britain's Westminster Abbey, an honor given to no other American.

Longfellow's most popular poetry is not always his best work. To appreciate him fully, it is necessary to read the lyrics he wrote in his later years, especially the sonnets in which he writes of nature, religion, his friends, and his books.

EDWARD WAGENKNECHT

See also COURTSHIP OF MILES STANDISH; EVANGELINE; HIAWATHA.

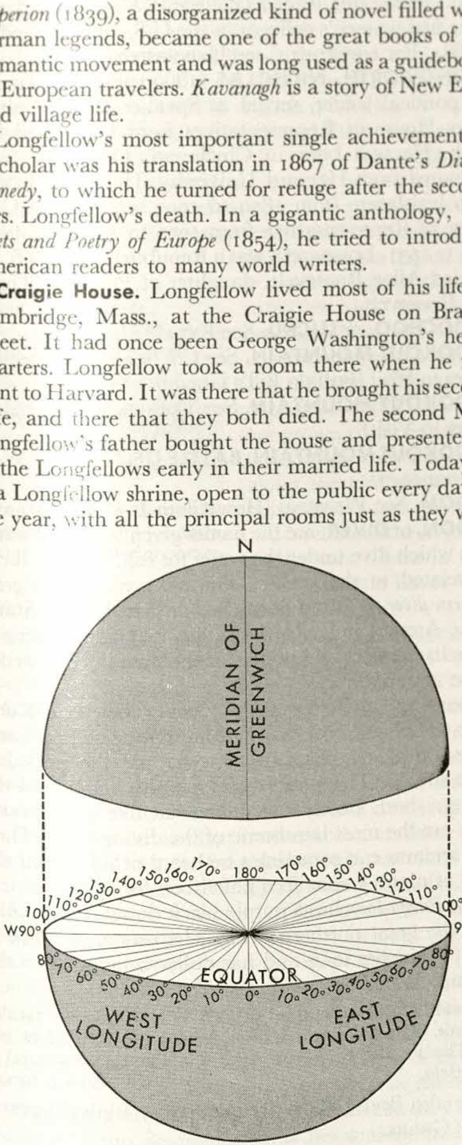
LONGHAIR is a breed of cat. See CAT (Breeds of Cats; color picture, White Longhair).

LONGHORN. See CATTLE (History; color picture, Longhorn); TEXAS (color map, Historic Texas).

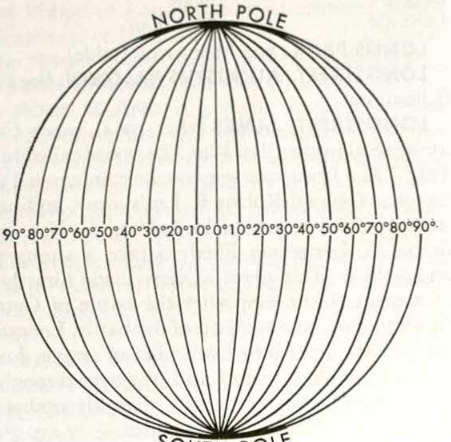
LONGITUDE, *LAHN jih tyood*. If one person travels directly north, and another person 50 miles west also travels directly north, their paths will meet at the North Pole. Each person will have traveled in the same direction along a *line of longitude*. Lines of longitude run north and south along the earth's surface. Map makers think of the earth as a huge globe divided into 360 equal parts. The lines between the parts on the outside of the globe are called *meridians*. These meridians are the principal lines of longitude on maps.

Longitude and Location. Most nations start counting longitude east and west from an imaginary line running through Greenwich Observatory, near London, England. These countries have agreed that Greenwich lies at 0° longitude. A place halfway around the world from Greenwich lies at 180° longitude.

The earth is divided into two parts, or hemispheres, of east and west longitude. Each hemisphere has 180



Meridians of Longitude are lines drawn from north to south on maps and globes to indicate distances and locate points. The prime meridian passes through Greenwich Observatory in England. All meridians of longitude meet at the North and South poles, below. The distance between meridians is greatest at the equator. It gradually decreases as the meridians near the poles.



degrees. Degrees of longitude are used to measure east and west distances on maps, and to locate certain points. For example, New York City lies at 74° west longitude. This means that if a person travels west from Greenwich to New York City and counts the imaginary meridians as he passes them, he would find New York City on the 74th meridian west of Greenwich. Sailors and pilots use longitude to help determine the location of their ships and airplanes.

The space between two meridians is greatest at the equator. This space narrows as the lines of longitude approach the North Pole and the South Pole. For example, a degree of longitude at New Orleans, La., is about 60 miles wide. At Winnipeg, Canada, which lies much nearer the North Pole, a degree of longitude is less than 45 miles wide. At Fairbanks, Alas., which is even closer to the pole than Winnipeg, it is even narrower.

Longitude and Time. Any point on the earth's surface passes through a whole circle—360 degrees—once every 24 hours. It does this because the earth turns once on its axis every 24 hours. All 360 degrees of the earth's circumference also pass beneath the sun once in 24 hours. In *one* hour, $\frac{1}{24}$ of 360 degrees, or 15 degrees, passes beneath the sun. Because it seems that the sun is moving instead of the earth, people say that one hour of time equals 15 degrees of longitude.

Each degree of longitude is divided into 60 parts called minutes. Each minute is divided into 60 seconds of longitude. One minute is written as $1'$, and one second as $1''$. These minutes and seconds of longitude measure distance, not time. But, since an hour of time equals 15° of longitude, a minute or second of time equals a certain distance that can be expressed in minutes and seconds of longitude.

The following table gives the equivalent in distance, expressed in degrees, minutes, and seconds, for five units of time, ranging from a day to a second:

24 hours of time = 360° of longitude.
1 hour of time = 15° of longitude.
4 minutes of time = 1° of longitude.
1 minute of time = $15'$ of longitude.
1 second of time = $15''$ of longitude.

PAUL SOLLENBERGER

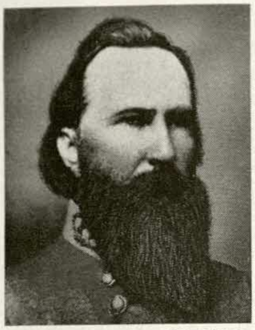
Related Articles in WORLD BOOK include:

Degree
Latitude
Map
Meridian
Time Zone

LONGS PEAK. See MOUNTAIN (table).

LONGSTREET, AUGUSTUS BALDWIN. See GEORGIA (Literature).

LONGSTREET, JAMES (1821-1904), was a Confederate general in the Civil War. His troops called him "Old Pete." As a lieutenant general, he commanded the First Corps of General Robert E. Lee's army, and he fought in most of the major battles in Virginia. Not aggressive in battle, Longstreet liked to take a strong position and hold it. This point of view made him the center of a great controversy after the battle of Gettysburg. According to some students of the battle, Longstreet did not put his heart into Lee's plan of attack. Lee, however, continued to count on Longstreet throughout the Civil War. Longstreet was a dogged combat soldier and an able defensive commander.


Brown Bros.

James Longstreet

Longstreet was born in Edgefield District, South Carolina. He was graduated from the United States Military Academy in 1842, and fought in the Mexican War. In 1880, Longstreet, who had allied himself with the Republicans, was appointed minister to Turkey. He served as U.S. Commissioner of Railroads from 1898 until his death in 1904.
FRANK E. VANDIVER

LONGWOOD COLLEGE is a state-controlled school for women at Farmville, Va. Courses offered include teachers' training, liberal arts, and business education. Courses lead to bachelor's and master's degrees. Longwood was the first teachers college in Virginia and one of the first women's colleges in the U.S. It was founded in 1884. For enrollment, see UNIVERSITIES (table).

LONGWORTH, NICHOLAS (1869-1931), an American political leader, served as Speaker of the United States House of Representatives from 1925 until his death. He was born in Cincinnati, Ohio, and was graduated from Harvard University. He served in the Ohio legislature from 1899 to 1903, and in the U.S. House of Representatives from 1909 to 1913 and from 1915 to 1931. Longworth was a Republican. In 1906, he married Alice Roosevelt, daughter of President Theodore Roosevelt.
NELSON M. BLAKE

LOOCHOO, or **LUCHU.** See RYUKYU ISLANDS.

LOOKOUT MOUNTAIN. See COLORADO (Interesting Places to Visit [Buffalo Bill's Grave]).

LOOKOUT MOUNTAIN. See TENNESSEE (Interesting Places to Visit).

LOOKOUT MOUNTAIN, BATTLE OF. See CIVIL WAR (Chattanooga).

LOOM. See WEAVING (How Cloth Is Woven).

LOON, or **DIVER,** are the names given to several water birds which dive under the water for fish. Most of them are related to the grebes. The *common loon,* or *great northern diver,* is found from the northern United States to the Arctic Circle. In the summer, this loon likes to make its home in the small, lonely lakes in the interior of the country.

Loons are about 36 inches long. Their backs and wings are black, with many white spots. The heads and necks are glossy black and green, and the neck has white streaks. The webbed feet are also black, and the tails are short. Loons look somewhat like large ducks. They are the most handsome of the diving birds. Their loud screams can sometimes be heard echoing over the lakes at night. Loons feed chiefly on fish.

The *Pacific loon* has a purple-black throat. It is smaller than the great northern diver. The *red-throated diver* is about 25 inches long and has duller coloring than the common loon.

Scientific Classification. Loons belong to the family *Gaviidae.* The common loon is genus *Gavia,* species *immer.* The Pacific is *G. arctica pacifica.* The red-throated is *G. stellata.*
JOSEPH J. HICKEY

See also BIRD (color pictures, Water Birds; Types of Feet); GREBE.

LOOP, THE. See Chicago (The Loop).

LOOP ANTENNA. See Antenna.

LOOPER. See Measuring Worm.

LOOSESTRIFE is any one of a group of more than 70 plants that belong to the primrose family. *Golden loosestrife*, native to Europe and Asia, is grown in the United States. It has sword-shaped leaves and yellow flowers. *Moneywort*, also called *creeping Charlie* and *creeping Jennie*, thrives in moist soils. It grows as a creeping vine and bears bright yellow blossoms.

Scientific Classification. Loosestrifes are in the family *Primulaceae*. Golden loosestrife is genus *Lysimachia*, species *vulgaris*. Moneywort is *L. nummularia*. Donald Wyman

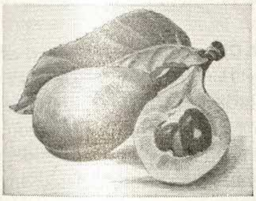
LOPE DE VEGA. See Vega, Lope De.

LÓPEZ, CARLOS ANTONIO and **FRANCISCO SOLANO.** See Paraguay (Independence; Military Ruin).

LÓPEZ MATEOS, ADOLFO (1910-), was elected president of Mexico in July, 1958, for a six-year term. Before his election, he served as secretary to the head of his party. He was also a national senator and manager of the election campaign of his predecessor, Adolfo Ruiz Cortines. As Secretary of Labor in Ruiz' cabinet, he earned the respect of both labor and management. López Mateos was born in Atzapan, Mexico. A lawyer by profession, he taught history and literature. See also Mexico (The 1950's). Harold E. Davis

LOQUAT, *LO kwaht*, is an orange-yellow fruit that has the shape and size of an egg. A loquat is a *pome*, a type of fruit that has many seeds inside a papery core. It grows on the loquat tree, a small evergreen from 18 to 25 feet high. A native of central China, the loquat was brought to the United States from China and Japan in 1784. Loquats are grown commercially in California. They also grow along the Gulf Coast and in northern South America.

The flesh of the loquat is mildly tart. It has a delicate, aromatic flavor. The fruit is good fresh, cooked, and as a jelly.



Orange-Yellow Loquats, which have a mildly tart taste, are used in jellies and preserves.

Scientific Classification. The loquat is a member of the family *Rosaceae*. It is classified as genus *Eriobotrya*, species *japonica*. Reid M. Brooks

LORAIN, Ohio (pop. 68,932; alt. 610 ft.), is an industrial city located on the shore of Lake Erie at the mouth of the Black River (see Ohio [map]). Natural advantages have made this city one of the leading iron and steel centers of Ohio, as well as a great shipping center. The city's excellent harbor accommodates large freighters with iron ore from Lake Superior mines and coal from Ohio and other states. Products manufactured in Lorain include bearings, clothing, diesel engines, electrical equipment, ingots and steel for castings, steel pipes and tubes, power shovels, ships, and toys. The pipe for the "Big Inch" oil line from Texas to New Jersey was made here (see Big Inch). Lorain was first settled in 1807, chartered as Charleston in 1836, and renamed in 1876. It has a mayor-council form of government. James H. Rodabaugh

LORAN stands for **LO**ng **RA**nge **N**avigation. It is a system of radio navigation that helps ships and aircraft find their positions. Two stations, known as the *master* and the *slave* stations, continually send out radio signals. The ship or aircraft receives these signals with special equipment. The receiver equipment measures the time interval between the pulses it receives from the stations. The difference in time between receiving the signals from one pair of stations places the ship or aircraft at some point on a *loran line of position* on a chart. The chart is marked to show the position of the ship or aircraft according to the difference in time between the signals. In actual operation, two pairs of transmitting stations are used. This allows the navigator to *intersect*, or cross, two loran lines of position to fix his position.

Loran is effective up to about 800 miles during the day and about 1,600 miles at night. A position can be located to within half a mile. G. D. Dunlap

See also Navigation (Modern Navigation); Shoran.

LORAS COLLEGE is a liberal arts and science school for men at Dubuque, Iowa. The college is conducted by the Roman Catholic Church. It offers a five-year program in liberal arts and engineering. Loras has a summer session and an extension division. The school was founded in 1839. For enrollment, see Universities and Colleges (table).

LORCA, *LOHR kah*, **FEDERICO GARCÍA** (1899-1936), a Spanish poet and dramatist, won acclaim in 1928 when he published a book of ballads, *Romancero Gitano (Gypsy Ballads)*. He always identified himself with the people of his native Andalusia. He was passionately fond of the *cante jondo*, the typical Andalusian song. Violent passions dominate his three great tragedies, *Bodas de Sangre (Blood Wedding)*, *Yerma (Barren)*, and *La Casa de Bernarda Alba (The House of Bernarda Alba)*. García Lorca was killed by troops of General Franco during the Spanish Civil War. He was born near the city of Granada. Harvey L. Johnson

LORD is a title added to a person's name or to his office. Great Britain's House of Lords includes the peers, called *Lords Temporal*, and dignitaries of the Church of England, called *Lords Spiritual*. The word *lord* is often used as a less formal title for a marquis, earl, or viscount, and always for a baron. The younger sons of dukes and marquises have the courtesy title added to their names. The title is used with the names of bishops (the Lord Bishop of London) and government offices (Lord Lieutenant of Ireland). I. J. Sanders

See also Nobility with its list of Related Articles.

LORD HIGH CHANCELLOR. See Chancellor.

LORD HOWE ISLAND is a coral island 436 miles northeast of Sydney, Australia. For location, see Pacific Ocean (color map). This crescent-shaped island is about 7 miles long and 1 mile wide, and covers 5 square miles. Dense vegetation blankets it. The land is mountainous. Its many cliffs were cut into the coral by the wash of the waves. The people engage in farming, fishing, and the tourist trade. About 130 persons live on the island, which was discovered in 1788. New South Wales governs it. C. M. H. Clark

LORD MAYOR. See Mayor.

LORD PROTECTOR. See Cromwell, Oliver.

LORDS, HOUSE OF. See House of Lords.

LORD'S DAY. See Sunday.

LORD'S PRAYER might also be called "the Disciples' Prayer," because Jesus taught it to His disciples as an example of the proper form of prayer. It contains the qualities which Jesus intended a prayer to have. It recognizes the greatness and majesty of God, and it pleads for His kingdom to come. It also asks for the forgiveness of sins, and for spiritual and physical help.

The Lord's Prayer appears in two forms in the New Testament Gospels: in Matthew 6: 9-13, and in Luke 11: 2-4. The form in Luke is shorter. It is, however, the same prayer, although some students of the Bible have thought that the two forms were taken from two different speeches of Jesus. The line "Forgive us our debts" is in the version in Matthew, while "Forgive us our sins" is in Luke. In the Greek language, the word for *to sin* meant originally *to go astray*, or *to miss the mark*. This carries about the same meaning as *to trespass*, and explains why some churches use *trespasses* and others *debts*.

THE LORD'S PRAYER

Three of the most used versions of the Lord's Prayer are:

The Authorized, or **King James, Version** (Protestant) from Matthew:

Our Father which art in heaven, Hallowed be thy name. Thy kingdom come. Thy will be done in earth, as it is in heaven. Give us this day our daily bread. And forgive us our debts, as we forgive our debtors. And lead us not into temptation, but deliver us from evil: For thine is the kingdom, and the power, and the glory, for ever. Amen.

The Revised Standard Version (Protestant) from Matthew:

Our Father who art in heaven, Hallowed be thy name. Thy kingdom come, Thy will be done, On earth as it is in heaven. Give us this day our daily bread; And forgive us our debts, As we also have forgiven our debtors; And lead us not into temptation, But deliver us from evil. Amen.

The Baltimore Catechism Version (Roman Catholic) from Matthew:

Our Father who art in heaven, hallowed be Thy name; Thy kingdom come; Thy will be done on earth as it is in heaven. Give us this day our daily bread; and forgive us our trespasses, as we forgive those who trespass against us; and lead us not into temptation, but deliver us from evil. Amen.

The Lord's Prayer has been set to music by several people. One of the best-known versions is that by Albert H. Malotte. FULTON J. SHEEN and BERNARD RAMM

LORD'S SUPPER. See COMMUNION.

LORELEI, *LAWR uh lie,* is a high cliff that towers about 430 feet above the Rhine River between St. Goar and Oberwesel in Germany. At that point, the river is swift-flowing and dangerous. Legend says that the remarkable echo heard at the cliff is the voice of a beautiful but wicked siren, or river nymph, luring riverboatmen to destruction. The German writer Clemens Brentano may have invented the myth in 1802. The Lorelei is the subject of a poem by Heinrich Heine, and of an unfinished opera by Felix Mendelssohn. Other writers have also written about the Lorelei. FRANK O. AHNERT

LORENTZ, HENDRIK ANTOON (1853-1928), was a Dutch physicist. He became famous for his electron theory of matter, and shared the 1902 Nobel prize for physics with Dutch physicist Pieter Zeeman for discovering the effects of magnetism on light (Zeeman effect).

Lorentz assumed that matter consists of electrically charged particles. His electron theory showed that moving bodies would appear to be shortened in the direction of motion. This was because the forces between the charged particles could be affected by the motion, making the length of the bodies appear different when measured at rest. The change in length is too small to notice except in precise experiments carried on at extremely high speeds.

The equations that show how bodies are deformed by motion are called the *Lorentz transformations*. Lorentz' theory predicted effects similar to those predicted by Einstein's theory of relativity (see RELATIVITY [picture]). Lorentz was born at Arnhem, The Netherlands, and was graduated from Leiden University. CARL T. CHASE

LORENZINI, CARLO. See COLLODI, CARLO.

LORENZO THE MAGNIFICENT. See MEDICI.

LORETTO HEIGHTS COLLEGE is a liberal arts college for women at Loretto, Colo. The college is conducted by the Roman Catholic order of Sister of Loretto at the Foot of the Cross. Courses offered at the college lead to the B.A. and B.S. degrees. Loretto Heights College was founded in 1918. For enrollment, see UNIVERSITIES AND COLLEGES (table).

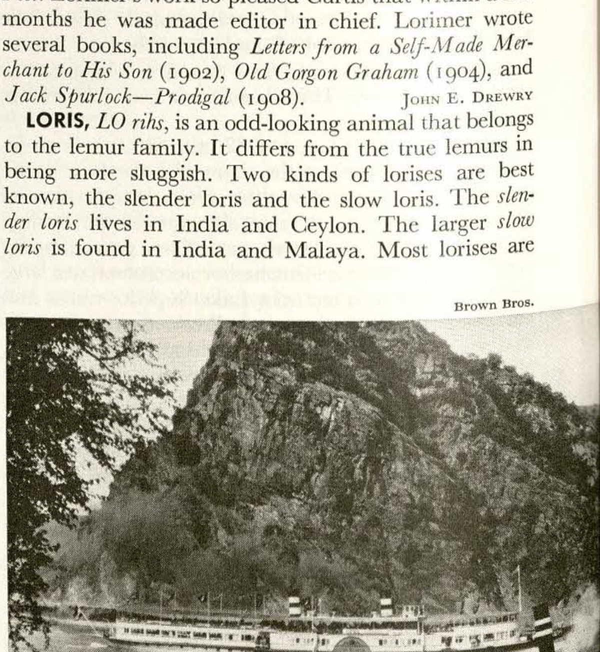
LORIKEET. See PARROT.

LORIMER, GEORGE HORACE (1868-1937), served as editor of the *Saturday Evening Post* for almost 40 years. Through his efforts, the circulation of the weekly magazine grew from about 2,000 to more than 3,000,000.

Lorimer was born in Louisville, Ky. He attended Colby College and Yale University, and started his journalistic career as a reporter on the *Boston Post.* He was working as a free-lance writer when Cyrus H. K. Curtis hired him in 1899 as temporary editor of the *Post.* Lorimer's work so pleased Curtis that within a few months he was made editor in chief. Lorimer wrote several books, including *Letters from a Self-Made Merchant to His Son* (1902), *Old Gorgon Graham* (1904), and *Jack Spurlock—Prodigal* (1908). JOHN E. DREWRY

LORIS, *LO rihs,* is an odd-looking animal that belongs to the lemur family. It differs from the true lemurs in being more sluggish. Two kinds of lorises are best known, the slender loris and the slow loris. The *slender loris* lives in India and Ceylon. The larger *slow loris* is found in India and Malaya. Most lorises are

Brown Bros.



The Cliff of the Lorelei towers high above a passenger steamboat on the Rhine River. ▶

New York Zoological Society

The Slow Loris of India and Malaya has well-developed and flexible toes. It can use its feet as hands in climbing.

gray or brown, and are from 8 to 15 inches long. Their three-cornered faces and large eyes give them a weird appearance. They have no tails.

The loris sleeps in the daytime, with its feet clasped around the limb of a tree. It rolls itself into a ball with its head between its thighs. At night it prowls around in search of food. It eats young leaves and tender shoots, fruit, insects, birds, and bird eggs.

Scientific Classification. Lorises are in the family *Lorisidae.* The slender loris is genus *Loris*, species *gracilis.* The slow loris is *Nycticebus tardigradus.* W. M. MANN

See also LEMUR.

LORNA DOONE. See BLACKMORE, RICHARD D.

LORNE, *lawrn*, **MARQUIS OF** (1845-1914), JOHN DOUGLAS SUTHERLAND CAMPBELL, served as governor-general of Canada from 1878 to 1883. He married Princess Louise Alberta, the fourth daughter of Queen Victoria. The Canadian province of Alberta was named for her. The Marquis enjoyed great popularity, and wrote seven books, including two about Canada and one about the United States. His political career started in the British Parliament in 1868. In 1900, he became Duke of Argyll. He was born in London. LUCIEN BRAULT

LORRAIN, CLAUDE (1600-1682), a French painter, became a founder of the European landscape tradition prior to the 1800's. His paintings of the Roman countryside, with golden light slanting across the fields, captured the visual imagination of European landscape painters for almost 150 years.

Lorrain often sketched outdoors from sunrise to sunset, watching the effects of changing light on the landscape. But he painted his canvases in his studio, organizing trees, streams, mountains, and fields into carefully planned artificial scenes. The human figures appearing in the foregrounds were probably painted by others. Lorrain confined himself to a rather narrow range of greens, blues, and golden browns. But he used these colors so skillfully that the effect of late afternoon light is instantly suggested. His painting, *Seaport: Embarkation of the Queen of Sheba*, appears in color in the PAINTING article.

Lorrain was born at Chamagne, France, in the province of Lorraine. His real name was Claude Gellée, but he took the name of the province. Orphaned as a child, he wandered through Europe for a number of years. In 1627, he settled in Rome, and lived and painted in the city for 55 years until his death. JOSEPH C. SLOANE

Culver

Claude Lorrain

LORRAINE. See ALSACE-LORRAINE.

LORY, *LOH rih*, is a small parrot noted for its brilliant feathers of red, green, blue, yellow, and purple. Lories live only in the Australasian region. They differ from most parrots because their tongues end in hairs, like brushes. Lories use their tongues to feed on flower nectar and pollen. They also like fruit. The bill is red or orange, and is rather light and weak.

Scientific Classification. Lories belong to the family *Psittacidae*, subfamily *Loriinae.* The blue-crowned lory is genus *Vini*, species *australis.* RODOLPHE M. DESCHAUENSEE

See also PARROT.

LOS ALAMOS, *lohs AL uh mohs* (pop. 13,037), stands on a mesa 45 miles northwest of Santa Fe in the northern part of New Mexico. The town, the seat of Los Alamos County, lies near the Jemez Mountains, at an altitude of 6,789 feet. For location, see NEW MEXICO (color map).

The Atomic Energy Commission built Los Alamos in 1943 as a place in which to carry on highly secret research on making the atomic bomb. The town has become known as the birthplace of the world's first atomic bomb. The government research laboratories provide the major source of income for the residents.

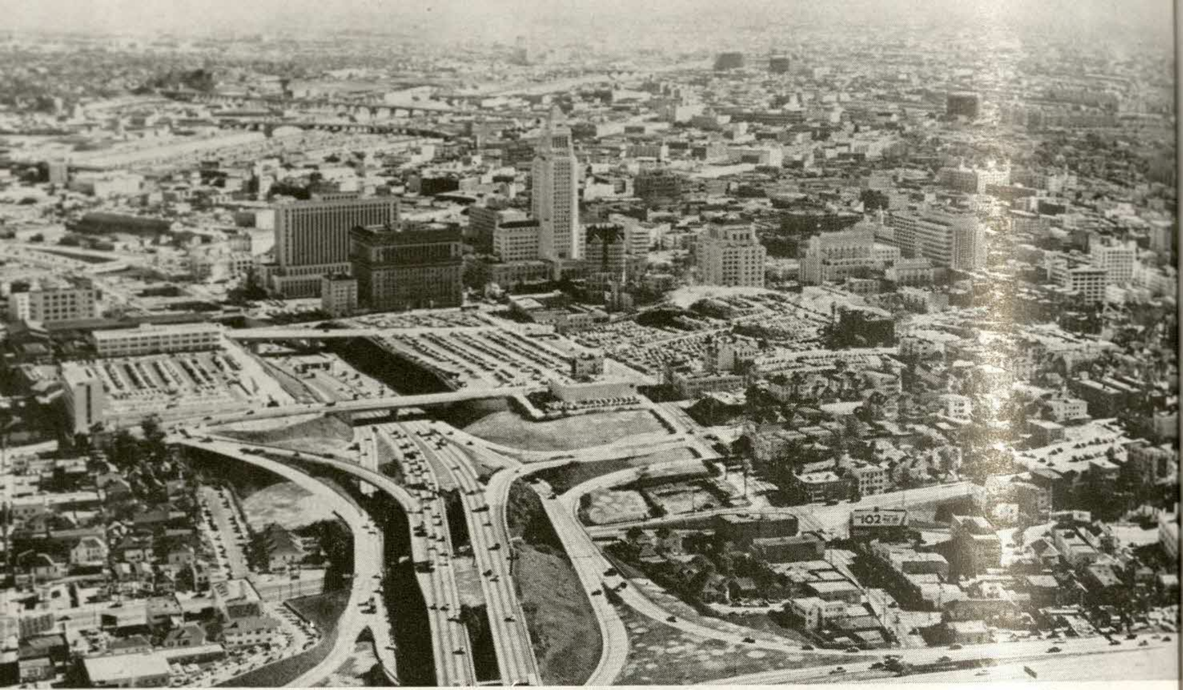
The U.S. Atomic Energy Commission owns the town, which has a council-manager government. Voters elect a seven-member council that acts as a link between the residents and the Atomic Energy Commission.

Scientists who live on the wind-swept mesa make major contributions to the development of small power reactors, to metallurgy, and to chemistry. The health center operated by the AEC has devoted its laboratories to developing methods of fighting diseases.

Los Alamos houses the administrative headquarters of the U.S. Atomic Energy Commission's Santa Fe Operations Office. AEC officials closed Los Alamos to all but official visitors from 1943 until March, 1957. It then permitted free access to the town.

The New Mexico state legislature established Los Alamos County, governed by a three-commissioner board, in 1949. The county includes the AEC areas, Los Alamos, and White Rock. FRANK D. REEVE

LOS ANGELES. See AIRSHIP (German Airships; United States Airships).



Los Angeles Chamber of Commerce

Los Angeles is the third largest industrial center in the United States. Many freeways cross the vast city. Some lead to the downtown Civic Center, with its 32-story City Hall.

LOS ANGELES, *laus AN guh lus* or *laus ANG uh lus*, Calif. (pop. 2,479,015; met. area, 6,742,696), sprawls over more than 450 square miles, a larger area than any other city in the world. It has twice the area of Chicago, and more than 10 times that of San Francisco. More people live in Los Angeles than in any other American city west of Chicago. It has the largest population in California, and the third largest in the United States. Its growth from an 1850 population of 1,610 is one of the fastest of any American city.

The sunny climate attracts many visitors and permanent residents to the city. Every year thousands of tourists visit Hollywood, a famous district of Los Angeles that is the capital of the motion-picture industry. More than 14,000 factories make Los Angeles the third largest industrial center in the country. The city ranks high in the manufacture of aircraft, electronic equipment, and sports clothes.

The great harbor on San Pedro Bay is the largest man-made harbor in the world. Ships carry more than 24,000,000 tons of cargo through this port each year.

Los Angeles serves as a market and shipping center for Los Angeles County, one of the richest farm counties in the country. The city is also a trade center for parts of Arizona, New Mexico, Nevada, Utah, and Mexico.

The Spanish governor of Upper California, Felipe de Neve, founded Los Angeles in 1781. He named it *El Pueblo de Nuestra Señora la Reina de Los Angeles*, or *The Town of Our Lady*, *Queen of the Angels*. The first part of the name was dropped when Los Angeles became a Mexican city in 1835. Los Angeles is often called *The City of the Angels*. The people call themselves *Angelenos*.

Los Angeles from the Air

Los Angeles lies on the Pacific Coast in southern California, about 430 miles southeast of San Francisco. The Mexican border is 120 miles to the south. For location, see CALIFORNIA (color map).

Passengers in an airplane flying low over the Los Angeles area may see that much of the city is flat. It has an average elevation of 340 feet above sea level. But the Santa Monica Mountains, with peaks more than 2,000 feet high, cut through Los Angeles from east to west. Most of the city spreads over a broad plain, dotted with citrus groves, truck farms, and oil fields. Clover-leafed highways crisscross vast stretches of land. Bright sunlight bathes the low white and pastel buildings in a brilliant glow. Red-tiled roofs add patches of color to the dazzling whiteness.

Los Angeles stretches about 50 miles north and south from the San Fernando Valley to the Los Angeles harbor at San Pedro Bay. The city extends about 30 miles east and west from the San Gabriel Mountains to the sea. The ocean and the mountains form natural boundaries, and protect the city from extreme heat and cold.

As the airplane swoops over the downtown area, passengers see the 32-story City Hall, the tallest building in southern California. Landscaped lawns and parkways surround City Hall and other government buildings in the Civic Center, the heart of the downtown area.

Passing over Civic Center, the plane gathers speed and heads west toward the ocean. It follows the tiny ribbon that is Wilshire Boulevard, one of the busiest streets in the world. The 15-mile-long boulevard is almost always jammed with traffic. Office buildings, department stores, restaurants, and night clubs line both sides of Wilshire. The part of the boulevard known as "Miracle Mile" is a section of handsome white buildings of modern design. The plane may circle around Los Angeles and pass over other well-known streets. They include Hollywood, Sunset, Santa Monica, Sepulveda, and Olympic boulevards.

As the plane circles, the passengers may notice that residential areas stretch in all directions from downtown Los Angeles. Homes range from the magnificent estates of motion-picture stars and business leaders to simple cottages and small adobe (sun-baked clay) houses. Many homes have outdoor swimming pools and patios of colored tiles. Each day, hundreds of vans bring in the household goods of new residents who pour into Los Angeles County at the rate of one every 140 seconds.

Through the years, Los Angeles has added to its vast area by annexing nearby cities and towns. These include the harbor cities of Wilmington and San Pedro (now the port of Los Angeles), Van Nuys, Encino, Tarzana, Venice, and Sawtelle. Other communities that became part of Los Angeles are Hollywood, Eagle Rock, Highland Park, Westwood Hills, Bel Air, and Playa del Rey. Beverly Hills is a separate city within Los Angeles. Nearby cities include San Fernando, Culver City, Universal City, Santa Monica, Inglewood, Burbank, and Pasadena.

The People

Most Angelenos are American-born whites. There are also many descendants of people who came from Mexico, Japan, China, and Portugal. Most Mexican families live in Boyle Heights in the northeastern section. Some sell *tortillas* (flat corn-meal cakes), Mexican candles, and trinkets in shops and booths along Olvera Street, the city's oldest street. Many Japanese live and work in the Japanese Quarter in the downtown area. The Chinese live in New China Town, also in downtown Los Angeles. Some of them operate China City, a tourist attraction made up of gaily decorated stores and restaurants grouped around a small plaza. Most of the Portuguese live in the San Pedro-Wilmington region. Many work in the tuna-fishing industry. Smaller groups include French, Germans, and Austrians.

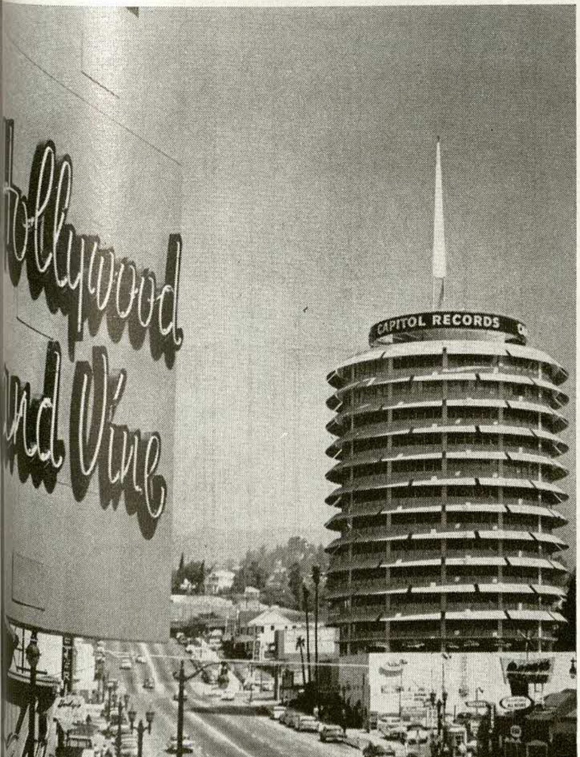
More than half the people are Protestants. The leading denominations include the Methodist, the Presbyterian, and the Baptist. About a fifth of the people belong to the Roman Catholic Church. Nearly a tenth are Jews.

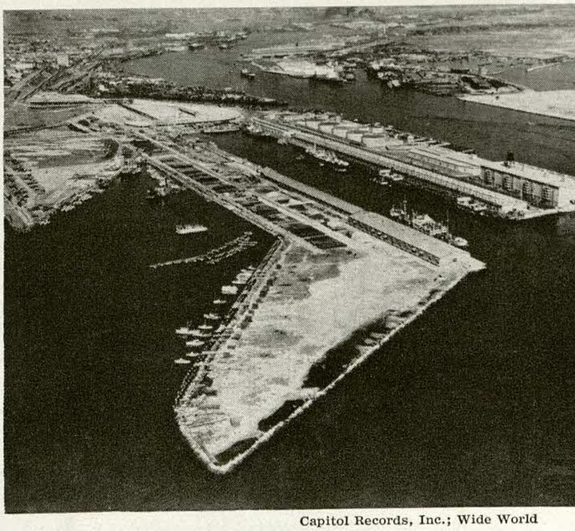
Work of the People

Industrial employment in the Los Angeles area more than doubled from the end of World War II to the 1960's. About 35 of every 100 employed persons work in the city's factories, and about 63 make their living in the distribution of goods and services. Los Angeles is the third largest industrial center in the country. It produces $5,872,000,000 worth of goods annually.

Industries. Los Angeles ranks high in the production of aircraft, airplane parts, and electronic equipment. Only Akron, Ohio, produces more rubber and tires than Los Angeles, and only Detroit makes more automobiles. Los Angeles stands third in oil refining, and manufactures more oil-field equipment than any other American city. It also serves as the shipping and distributing center for the rich mining districts and oil fields of southern California, Arizona, Nevada, and southwestern New Mexico. Los Angeles ranks first in the production of sports clothing, second to New York City in women's dresses, and second to Chicago in furniture making.

The tourist industry brings Los Angeles more than $500,000,000 a year. Thousands of vacationers visit motion-picture studios in and near Hollywood, where about nine tenths of all American films are made (see Hollywood; Motion Picture).



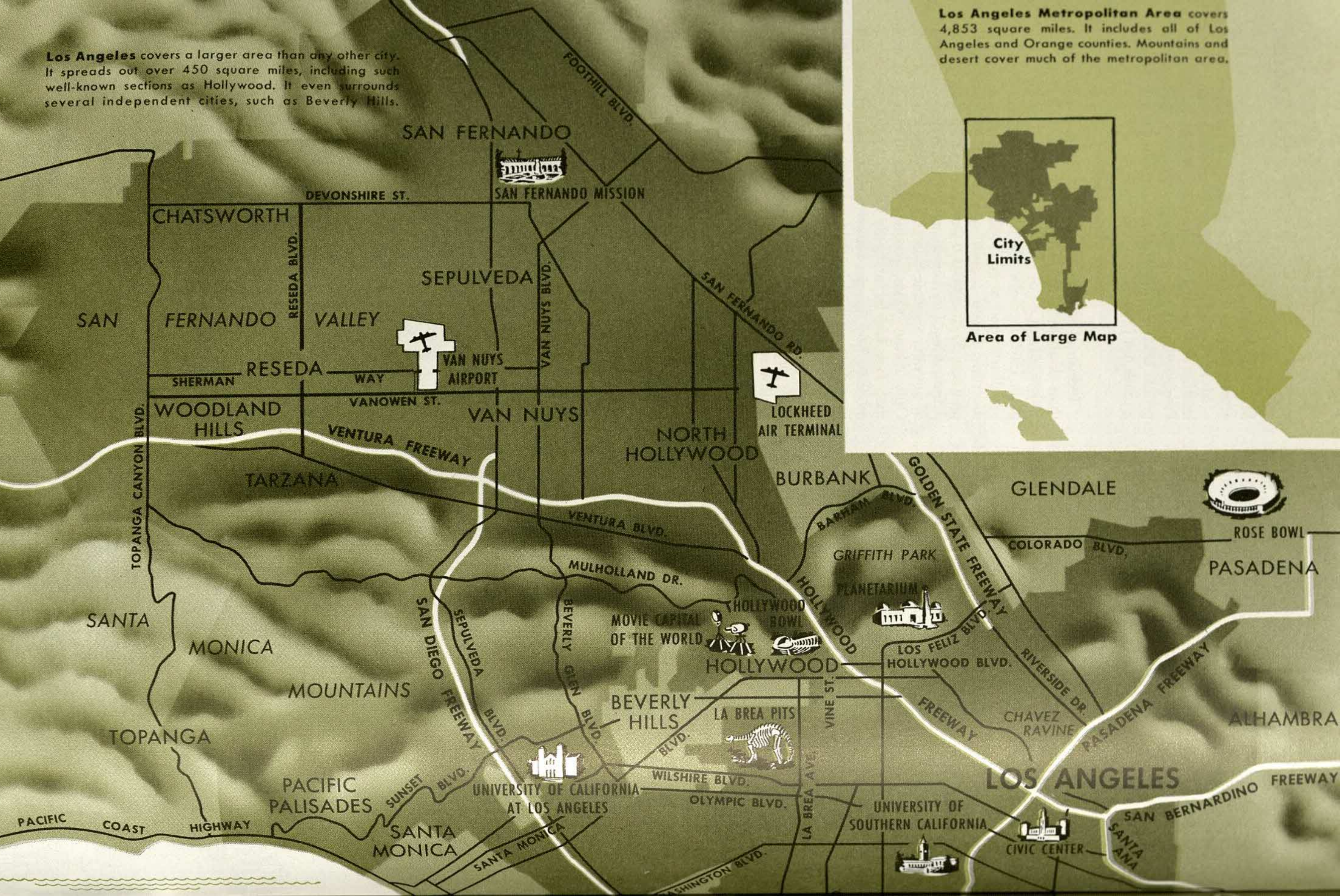


Capitol Records, Inc.; Wide World

Los Angeles Harbor, on San Pedro Bay, ranks as the largest man-made harbor in the world. It handles more than 24,000,000 tons of cargo every year.

Hollywood's Capitol Tower stands near the famous corner of Hollywood and Vine in Los Angeles. The Tower was built to resemble a stack of phonograph records.

Los Angeles covers a larger area than any other city. It spreads out over 450 square miles, including such well-known sections as Hollywood. It even surrounds several independent cities, such as Beverly Hills.

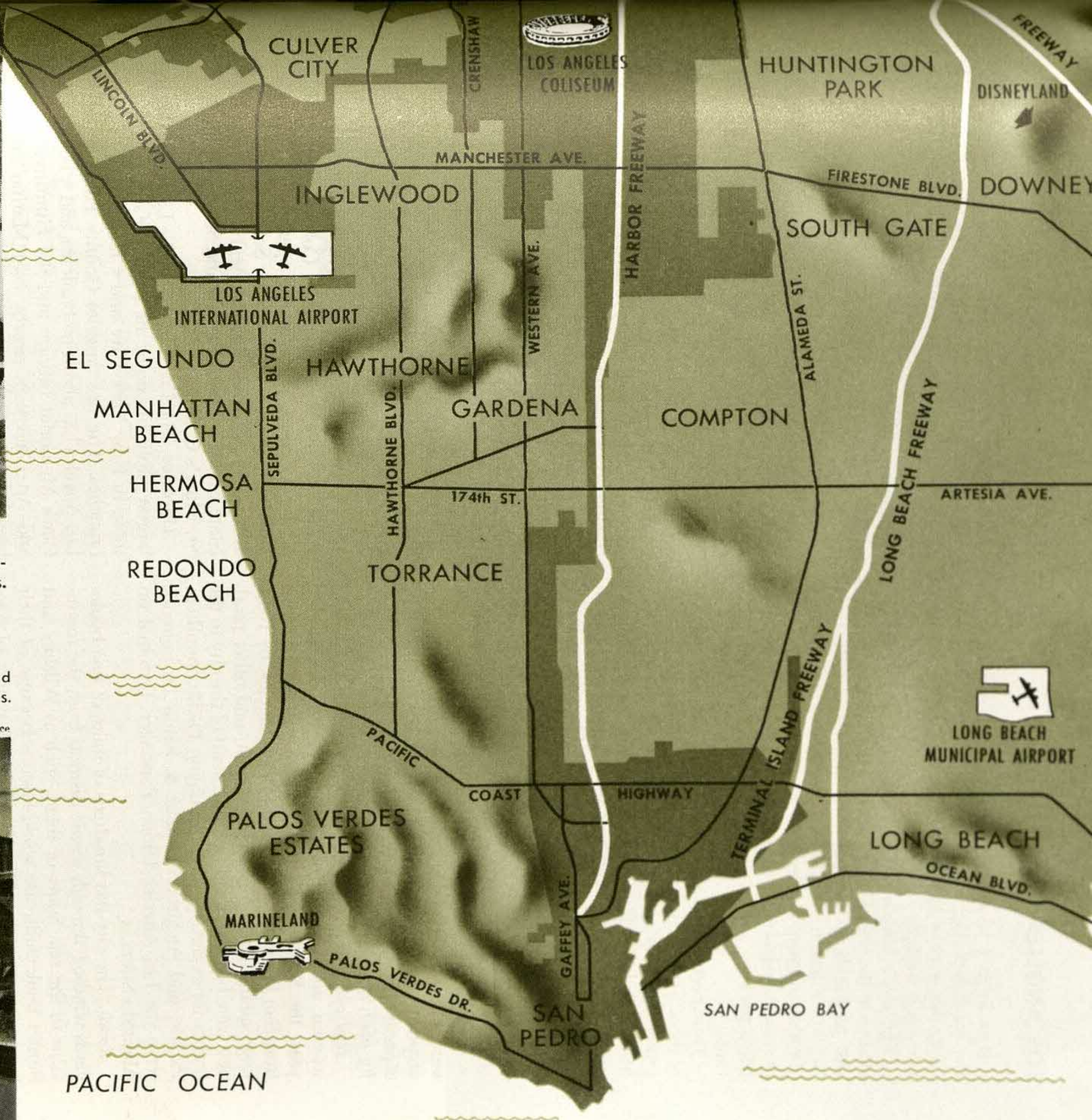


Los Angeles Metropolitan Area covers 4,853 square miles. It includes all of Los Angeles and Orange counties. Mountains and desert cover much of the metropolitan area.

San Fernando Mission, founded in 1797, is one of 21 missions built about a day's walk apart in California by Franciscans.

Farmers Market stands at the corner of Fairfax Ave. and 3rd St. Over 160 shops in the 24-acre bazaar sell a variety of goods.

Los Angeles Chamber of Commerce



The huge television industry in Los Angeles rivals the motion-picture industry. It centers in Television City, the world's largest and most complete group of television studios.

The city's harbor is one of the largest fish-canning centers in the world. Every day more than 400 commercial fishing boats unload their catches of barracuda, halibut, mackerel, sardines, tuna, and white sea bass.

Other industries include the manufacture of ceramics, chemicals, electrical equipment, and iron and steel. Meat packing, printing, and publishing are also important.

Transportation. Los Angeles is the western terminal of three transcontinental railways and several bus lines. Other railroads and bus lines connect the city with nearby regions. The port of Los Angeles provides 28 miles of sheltered harbor area for freighters and passenger ships from all parts of the world. The city owns and operates the Los Angeles International Airport.

Aviation. Many domestic and international airlines serve the city. About 300,000 airplanes land and take off at Los Angeles annually. In 1957, International Airport launched a three-year building program to provide one of the country's most modern terminals. The 265-acre terminal area features a central building, separate check-in buildings for passengers and baggage for each airline, and separate loading buildings.

Railroads. Until 1876, only stagecoaches, freight wagons, and ships served the Los Angeles area. In that year, the Southern Pacific Railroad extended its line from San Francisco southward to Los Angeles. By 1869, large quantities of fruit, wine, wheat, and other products were being shipped from the heart of the city to the harbor for export. Today, the Union Pacific, Southern Pacific, and Atchison, Topeka & Santa Fe railroads serve the Los Angeles Union Passenger Terminal on Alameda Street.

Roads. The city has hundreds of miles of fine boulevards winding through scenic districts from the mountains to the sea. Some of them, such as Wilshire and Sunset boulevards, are world-famous because of their stores, restaurants, and night clubs. A system of freeways for high-speed traffic extends from the outskirts of the city to and through the center of Los Angeles (see FREEWAY). More than 250,000 automobiles a day use the four-level, 60-foot-high Hollywood Freeway, the most heavily traveled road in the world.

Waterways. Los Angeles harbor at San Pedro and Wilmington is 20 miles south of the downtown area. It consists of an outer harbor and an inner one. Development of the outer harbor began in 1899. Los Angeles annexed San Pedro and Wilmington in 1909, and the inner harbor was dredged between 1912 and 1914. After the Panama Canal opened in 1914, more export markets became available to Los Angeles. The port ranks second on the Pacific Coast in cargo volume after San Francisco. It handles more than 24,000,000 tons a year.

Local Transportation includes bus lines, the interurban Pacific Electric Railway, and the Los Angeles Railway. The Los Angeles Metropolitan Transit Authority, a state-created public corporation, bought the major private transit lines in 1958.

Communication. Los Angeles has more than 100, newspapers, including four dailies, and over 140 periodicals. The dailies are the *Examiner*, *Herald-Express*, *Mirror-News*, and *Times*.

The first radio station in Los Angeles, KNX, began broadcasting in 1920. The first television station, KHJ, main station of the Don Lee Broadcasting System, was established in 1931.

Education

Schools. The first public grammar school in Los Angeles opened in 1855, with separate classes for girls and boys. In 1873, the city established the first public high school. Today, Los Angeles has about 400 grade schools, 100 junior high schools, and 50 senior high schools. A board of education, which is part of the state government, controls the public schools of the Los Angeles school district. The board consists of seven elected members who receive no pay. The school district includes Los Angeles and several communities in western Los Angeles County.

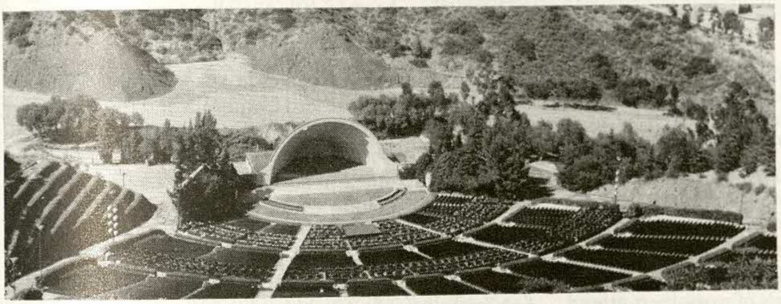
The first college, St. Vincent's College (now Loyola University of Los Angeles), received a state charter in 1869. The University of Southern California, founded in 1880, has professional schools in architecture, law, library science, religion, and other fields. A Presbyterian group founded Occidental College in 1887, and Roman Catholics opened the Immaculate Heart College for women in 1891. In 1919, the University of California established a branch at Los Angeles. In 1930, this branch became the University of California at Los Angeles. George Pepperdine College, a liberal arts school for men and women, opened in 1937. Other colleges include the Art Center School, Chouinard Art Institute, Los Angeles County Art Institute, Los Angeles State College of Applied Arts and Sciences, and Mount St. Mary's College.

Libraries. The Los Angeles Public Library is the third largest public library in the United States, ranking after those in New York City and Chicago. It has over 50 branches. The Los Angeles County Public Library in Los Angeles has about 90 branches and 5 bookmobiles. Clark Memorial Library and the Huntington Library and Art Gallery in nearby San Marino are research libraries. Firms in the aircraft, motion-picture, and other industries have specialized libraries.

Museums. The Huntington Library and Art Gallery exhibits famous paintings and sculptures, as well as rare books, porcelains, tapestries, bronzes, miniatures, and furniture. Henry E. Huntington, a California builder of power and light systems, constructed the art gallery in 1910 and made it his home. It has collections of English portraits painted in the 1700's. In one room hang *The Blue Boy* and five other paintings by Thomas Gainsborough, five paintings by Sir Joshua Reynolds, and Sir Thomas Lawrence's *Pinkie*. The Arabella D. Huntington Memorial Art Collection of Italian and Flemish paintings of the 1400's and 1500's forms part of the museum's collections.

The Los Angeles County Museum of History, Science, and Art owns paintings by Florentine and Sienese artists, and by Dutch and Flemish masters who painted during the 1600's. These include works by Rembrandt, Peter Paul Rubens, and Frans Hals. The Paul Rodman Mabury Collection of the museum includes masterpieces by Titian, Paolo Veronese, and Tintoretto. The

Los Angeles Union Passenger Terminal was built in the 1930's. It follows the Spanish mission style of architecture, so popular in California, which features low stuccoed walls and tiled roofs. Another feature of these missions, the patio, was also incorporated in the station.



Los Angeles Chamber of Commerce

Hollywood Bowl, *left*, offers many outdoor programs each year. Searchlights sweep the sky at the premiers of Hollywood motion pictures, *above*.

Southwest Museum in northeastern Los Angeles owns a fine collection of Indian relics.

The Arts

Architecture. Buildings of every size and style may be seen in Los Angeles. Mexicans built adobe missions and houses in the early 1800's. Before 1850, merchants who traded in hides and tallow came to the area and built homes in the New England style. Architects who came from the East after 1900 built houses in the American Colonial, French, and English styles (see ARCHITECTURE [Architecture in America]).

Bertram G. Goodhue, chief architect of the San Diego Exposition of 1915, built homes of traditional Mexican design. Many builders followed his lead.

Since 1930, Los Angeles has become famous as a center of modern design. Richard J. Neutra and R. M. Schindler, European-trained architects who won many prizes in national competitions, led in this modern trend. They stressed horizontal lines and contrasting vertical surfaces of concrete and glass. Frank Lloyd Wright designed several homes in the Los Angeles area.

Los Angeles has many beautiful churches. The Mormon Temple on Santa Monica Boulevard is one of the largest and most magnificent in the world. Angelus Temple is the mother church of the Foursquare Gospel, founded by Aimee Semple McPherson. This huge, circular building has a low-domed roof, with a revolving cross outlined with neon lights. The Plaza Church, oldest in the city, was dedicated in 1822. A bell tower stands near this Roman Catholic church.

Literature. The publication of Helen Hunt Jackson's novel *Ramona* in 1884 marked the beginning of Los Angeles literature. This book brought the life and historical background of southern California to the attention of the public. During the late 1800's, Charles Fletcher Lummis wrote several books about the region. One of the best known was *The Enchanted Burro*, a children's story.

Music. In 1895, Harley Hamilton, a leading musician, organized the Woman's Symphony Orchestra of Los Angeles, now the oldest orchestra on the Pacific Coast. William A. Clark, Jr., founded and financed the Los Angeles Philharmonic Orchestra in 1919. This orchestra plays at the Philharmonic Auditorium during the winter season, and at the Hollywood Bowl in summer. More than 20,000 persons can attend productions in the Hollywood Bowl, a 50-acre natural amphitheater owned by Los Angeles County. The removable sound shell of the stage, designed by Frank Lloyd Wright, helps speakers and musicians to be heard without a microphone.

Theater. Among the first Los Angeles theaters were the Don Antonio Coronel Theater, which opened in 1848, and Stearn's Hall, completed in 1859. Several theaters were built in the early 1900's, including the Belasco Theater, which opened in 1904. Grauman's Chinese Theater on Hollywood Boulevard is famous for the movie stars' handprints and footprints in the concrete of the forecourt. The old-time melodrama *The Drunkard* opened at the Mart in 1933, and ran until 1959. This was the longest run of any show at one theater anywhere in the world.

Hundreds of famous actors and actresses live in or

Los Angeles Chamber of Commerce

Griffith Park, *above,* is the largest city park in the United States. Included among its features is Fern Dell, a wooded ravine. Miles of fine beaches, *left,* also attract many Angelenos.

near Los Angeles. They act in plays at the legitimate theaters, and in motion pictures and television.

What to See and Do in Los Angeles

The motion-picture industry and its famous movie stars attract a constant stream of tourists. Los Angeles is also noted for its shops, theaters, night clubs, cafés, and restaurants. Sunny beach resorts near the city offer swimming, aquaplaning, and deep-sea fishing.

Every Easter morning, thousands of worshipers attend Sunrise Service in the Hollywood Bowl. On New Year's Day, more than a million persons line the streets of nearby Pasadena for the glamorous Parade of Roses. The parade is part of Pasadena's Tournament of Roses, inspired by the Carnival of Flowers at Nice, France. Since 1916, the climax of the tournament has been the famous Rose Bowl football game (see CALIFORNIA [color picture]).

Holidays and Festivals include the Southern California Festival of Allied Arts in early May, the Orange Harvest Festival in early September, the Farmers' Fair and Festival in October, and the Mojave Gold Rush Days in mid-October. The city's birthday celebration every September 4 features a pageant and parade. The Los Angeles County Fair is held at Pomona in late September.

Recreation. Los Angeles has more than 100 city parks and about 50 children's playgrounds, covering over 8,000 acres. Thousands of beautiful tropical plants and flowers grow in Griffith Park. This is the largest city park in the country, covering 4,253 acres. The Los Angeles Zoo in Griffith Park opened in 1912. Many of its animals have appeared in motion pictures. Other city parks include Elysian, Lincoln (formerly East Lake), Hollenbeck, Echo, and McArthur (formerly Westlake Park). Each has a lake for boating. City beaches include Cabrillo, Hermosa, Ocean Park, Palos Verdes, Playa del Rey, Redondo, and Venice.

The motion-picture producer Walt Disney built the 160-acre Disneyland amusement park at Anaheim, about 25 miles southeast of downtown Los Angeles. Castles, boat rides through "crocodile-filled" waters, and moon-rocket rides delight children and grownups.

The Brooklyn Dodgers, a National League baseball team, moved to Los Angeles in 1958. Football teams of the University of Southern California and the University of California at Los Angeles play their home games in Memorial Coliseum. The Los Angeles Rams, a professional football team, also play at the Coliseum. Other sports arenas include Carrell Speedway, Lincoln Park Stadium, Los Angeles Softball Park, Olympic Auditorium, Polar Palace, and Los Angeles Tennis Stadium. The Pan Pacific Ice Arena, largest indoor ice-skating rink in the country, covers 22,000 square feet.

Interesting Places to Visit in and about Los Angeles include the following.

Exposition Park is in the southern part of the city. It includes the State Exposition building; the Museum of History, Science, and Art; the Seventh Regimental Armory; and the Los Angeles Memorial Coliseum.

Farmers Market is a bazaar that covers 24 acres of Hollywood. It has over 160 shops that attract more than 30,000 visitors a day. This gala market sells everything from alfalfa juice to Hawaiian sportswear.

Forest Lawn Memorial Park, a cemetery on Glendale Avenue, has small chapels, ponds with graceful swans, a water tower, and a huge mausoleum. A stained-glass reproduction of Leonardo da Vinci's painting *The Last Supper* is in the Memorial Court of Honor.

Fort MacArthur, named for Lieutenant General Arthur MacArthur, was a defense post and personnel center in World War II. The National Guard trains here.

Hancock Park, in western Los Angeles, encloses the famous La Brea Pits, where thousands of animals were trapped in prehistoric times (see LA BREA PITS).

Knott's Berry Farm, southeast of the downtown district, includes a ghost town, a wagon camp, and a mile-long narrow-gauge railroad.

Olvera Street, in downtown Los Angeles, is a brick-paved lane that runs through the colorful Mexican community at the Spanish Plaza. Mexican craftsmen make the wares sold at shops and booths along the street.

Santa Catalina Island, 24 miles southwest of Los Angeles Harbor, has beaches and scenic mountains and valleys. Game fish in the surrounding waters attract many sportsmen (see CATALINA ISLAND).

Spanish Missions in San Fernando and San Gabriel are among the 21 missions built by Franciscan friars during the late 1700's and early 1800's.

Government

A mayor and a city council of 15 members, all elected to four-year terms, govern Los Angeles. The controller and city attorney are also elected. The mayor appoints additional administrative officials who serve for four years. He may remove them with the consent of the council.

The Municipal Department of Water and Power manages the water supply in Los Angeles and nearby communities. Water from the Owens River in the Sierra Nevada mountains and the Colorado River is pumped through two of the world's largest and longest aqueducts (see AQUEDUCT [Present-Day Aqueducts]). Power stations at Hoover Dam and Parker Dam on the Colorado River generate electricity for the city. Los Angeles also owns and operates the port of Los Angeles under the supervision of a board of harbor commissioners. The Airport Board manages the Los Angeles International Airport.

History

Indian Days. Records show that a branch of the Shoshoni Indian tribe lived in the Los Angeles area during the middle 1500's. A group of them settled in a village known as Yang-na, near the center of the present-day city. When Spaniards came to the region from Mexico in 1781, they found relics left by this primitive tribe. Descendants of the Shoshoni still live in California. See INDIAN, AMERICAN (California-Intermountain Indians).

Settlement. The Spanish governor of Upper California, Felipe de Neve, founded Los Angeles on Sept. 4, 1781. It was the second *pueblo*, or village, to be established in Spanish California. The first one was the pueblo of San José de Guadalupe (now San Jose), founded in 1777.

De Neve planned the settlement as a stopping point halfway between the San Gabriel and the San Fernando missions. Later, Los Angeles developed into a rich farming community. Mexico won its independence from Spain in 1821, and took over the government of Los Angeles in 1835. Under Mexican rule, Los Angeles and Monterey alternated as the capital of California. Several Mexican revolutions broke out in Los Angeles before American troops captured it during the Mexican War in 1847. After the war, in 1848, Mexico gave up the California region to the United States.

Development and Growth. Los Angeles was incorporated as an American city on Apr. 4, 1850, five months before California joined the Union. It had a population of only 1,610. For many years after California became a state, the city served as its chief cattle market.

The population of Los Angeles grew from 4,385 in 1860 to 8,728 in 1870. With the completion of the transcontinental railroad in 1876, the city grew rapidly. A disagreement between two competing railroads plunged fares to Los Angeles unbelievably low. In the spring of 1886, for example, one of these railroads charged only $1 for the trip from Kansas City to Los Angeles. The population reached 50,395 in 1890, and passed the 100,000 mark in 1900. The fastest population growth in Los Angeles occurred between the years 1920 and 1930, when the number of residents jumped from 576,673 to 1,238,048.

In 1939, the city ranked seventh among the industrial centers of the country. At the peak of war production during World War II, it stood second only to Detroit. Los Angeles became an aircraft-production center during the war. By the 1950's, the number of factories had increased to over 14,000. Gigantic new housing projects included Park La Brea, Lakewood, Panorama City, and Westchester.

Recent Developments. Los Angeles began the task of deepening its outer harbor in 1956. That same year, the city established the Air Pollution Control District to help control smoke and fumes from factories, automobiles, and incinerators. The district installed a special radio receiver in each of the hundreds of air-polluting industrial plants throughout the Los Angeles area. When any factory violates the city law regarding smoke, a danger alert is broadcast to the offending plant. The Air Pollution Control District trains inspectors at a special "smoke school." The inspectors are uniformed, and travel in automobiles equipped with two-way radios and cameras that provide photographic evidence of smoke violations.

The city began construction of a $46,000,000 165-acre, 13-building passenger terminal at International Airport in 1957. Plans were developed in 1958 for reclaiming the Bunker Hill section as a new residential and business area. Also in 1958, the 16½-mile Long Beach Freeway opened for traffic. Vehicles travel on this highway between Los Angeles and the coastal city of Long Beach.

GORDON O. ASKE

Related Articles in WORLD BOOK include:

Catalina Island	Metropolitan Area
Hollywood	Motion Picture
La Brea Pits	Pasadena
Long Beach	Smog

Outline

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Questions

What was the original name of Los Angeles?

When did a railroad ticket from Kansas City to Los Angeles cost only $1? Why?

In what respect is Los Angeles Harbor the largest of its kind in the world?

How and where does Los Angeles get its supply of water?

What two world-famous English paintings hang in the Huntington Art Gallery of Los Angeles?

What thoroughfare is the most heavily traveled in the world?

What Los Angeles park is the largest city park in the country? What is the size of this park?

How did the construction of the Panama Canal affect the development of Los Angeles?

What is the oldest street in Los Angeles?

What famous community operates as a separate city within Los Angeles?

LOS ANGELES CITY COLLEGE is a coeducational junior college in Los Angeles, Calif. Courses lead to the associate of arts degree. There is a summer session. The college was founded in 1929. Average enrollment is about 21,800.

LOS ANGELES COUNTY ART INSTITUTE is a coeducational school in the city of Los Angeles. Two years of college or junior college work are required for admission. The Institute's four-year degree courses start on the third year college level. Graduates receive M.F.A. degrees. The Institute was founded in 1918. For enrollment, see UNIVERSITIES (table). JARVIS BARLOW

LOS ANGELES NAVAL BASE, Calif., operates facilities for refitting ships of the United States Navy. It covers 15,400 acres, and lies on Terminal Island, about three miles west of Long Beach and 20 miles south of Los Angeles. The base was established in 1948. Its major commands include a naval station, marine barracks, naval ammunition and net depot in nearby Seal Beach, and the Long Beach Naval Shipyard. The base shipyard is the only United States naval shipyard with direct access to the sea. It can refit 400 vessels a year, and has three graving docks and a 2,800-ton concrete floating drydock. JOHN H. THOMPSON

LOS ANGELES STATE COLLEGE OF APPLIED ARTS AND SCIENCES is a coeducational state school at Los Angeles, Calif. It is a liberal arts college with additional programs in education, business administration, and engineering. It grants A.B., B.S., and M.A. degrees. The college has a work-study program which combines classroom instruction with work experience. There are no student residence halls. The college was founded in 1947. For enrollment, see UNIVERSITIES AND COLLEGES (table). HOWARD S. MCDONALD

LOST COLONY is the name given to an early settlement on Roanoke Island, off the shore of what is now the state of North Carolina. The colony is called *lost* because no one has ever discovered what happened to it. In 1948, an announcement was made that archaeological surveys by the National Park Service had located the outlines of the fort built by the lost colonists.

A little band of 108 men sailed from England on April 9, 1585. They were sent by Sir Walter Raleigh to settle in the new region then known as Virginia. This was a great territory in North America which stretched from the present state of Pennsylvania through the Carolinas.

The colonists who settled on Roanoke Island had hard times in the New World. They were surrounded by unfriendly Indians, and their supply of food ran short. Within a year the men sailed back to England on the ships of Sir Francis Drake. More colonists and needed supplies arrived from England within a few days after the men had left. Fifteen adventurers out of the second group of colonists remained in America.

In 1587 Raleigh recruited a group of 150 settlers for the colony in Virginia. John White, who led the group, was instructed to remove the settlement from Roanoke Island to the shores of Chesapeake Bay. But the sailors refused to carry the colonists farther than Roanoke Island. The group was forced to land there on July 22, 1587. Not one of the 15 men who had remained the year before was found alive.

On August 18, 27 days after the colonists landed, a baby girl was born. She was John White's grandchild, and the first English child born on the American continent. She was christened Virginia Dare.

White returned to England for greatly needed supplies. He was not able to come back to America until 1590. When he landed at the site of the English colony on Roanoke Island, he found no trace of the colonists,

The Only Clue to the Lost Colony was the word "Croatoan" carved on a tree. John White left the Roanoke colonists and sailed back to England for badly needed supplies. When he returned in 1590, the colonists had completely disappeared. Although there is no proof, some persons believe the colonists may have married into an Indian tribe and been forgotten.

Culver

except the word *Croatoan*, which was carved on a tree.

Some people thought that the colonists might have gone inland in the company of friendly Indians. But this could not be proved, and the colonists were never found. Among the few facts that make up the record of the Lost Colony are the arrival of the colonists, the birth and baptism of Virginia Dare, the return of John White, and the carved word *Croatoan*.

Today a group of Indians who call themselves *Croatans* live here and there among the hills of North Carolina. The Croatans usually have English names. Scholars have tried to establish some connection between the lost colonists and the group of Croatans in North Carolina. G. G. Dodds

See also North Carolina (color picture, Indian Corn Dance).

LOST TRIBES. See Jews (Israel and Judah).

LOT was Abraham's nephew. His story is told in the Old Testament. Lot lived in the city of Sodom (see Sodom). When Sodom and Gomorrah were destroyed by the angels of Jehovah because they were wicked cities, Lot fled from Sodom with part of his family. His wife, in defiance of the command they had been given, turned back to look at the fiery destruction of the cities, and was changed into a pillar of salt as punishment for her curiosity and disobedience.

LOTHAIR, *loh THAIR*, **I** (795?-855), a king of Germany, was Holy Roman Emperor from 840 until his death. His brothers took away his authority as king of Germany in 843, but gave him control as Holy Roman Emperor of northern Italy and Lorraine. See also Verdun, Treaty of.

LÖTSCHBERG TUNNEL, a nine-mile-long railroad tunnel, cuts through the Bernese Alps of south-central Switzerland near the Jungfrau. For location, see Switzerland (color map). The tunnel, part of the 46-mile-long Swiss Lötschberg Railway, opened in 1913. The railway connects Spiez and Brigue. Before the railroad reaches Kandersteg, the tunnel's northern entrance, it crosses many bridges and viaducts and passes through 38 tunnels. At Göppenstein, the tunnel's southern end, the railroad descends into the Rhône Valley, where it connects with the Simplon Tunnel leading into northern Italy. Franklin C. Erickson

LOTTERY is a gambling method for raising money. The lottery promoter usually sells numbered tickets to the public and puts duplicate numbered tickets in a container. Later, a certain number of the duplicates are drawn at random from the container. The persons who hold the tickets bearing these numbers win prizes. The promoter keeps the difference between the money taken in and the cost of the prizes.

Lotteries in various forms go back as far as written records. They were first held by individuals, but were soon used by governments for public benefit. Later, laws prohibited lotteries without government approval.

An English lottery in 1612 supported the English settlement at Jamestown, Va. Lotteries also financed various state and local governmental functions in America. Between 1744 and 1894, more than 1,300 separate lotteries were approved. Churches and such school buildings as Harvard University's Holsworthy Hall were built in this manner during the 1800's. The Louisiana State Lottery became so prosperous that in 1890 it could offer $1,250,000 a year for a new charter. During the 1830's, many Americans began to oppose lotteries. State after state prohibited the drawings. Finally, by 1894, Congress had closed interstate and foreign commerce to lottery materials. Although lotteries are outlawed in the United States, governments of many other countries still hold them. John S. Ezell

See also Gambling; Ireland (Way of Life).

LOTUS is a name given to many different kinds of plants. The lotus known in more places than any other is the Egyptian water lily. The American lotus is also well known.

The Egyptian water lily is a familiar sight along the Nile River and neighboring streams. This plant has white or rose-purple flowers that may be a foot across. They grow on a weak stalk, four to eight feet long, and rise only a little above the water. The leaves spread out on the surface of the water.

The lotus was a sacred flower to the Egyptians, and is the national flower of Egypt and India. The ancient Egyptians showed a species of this plant in their picture writing and works of art. The sacred lotus of India and of China is a member of the same family.

The American lotus is a close relative of the East-Indian lotus. It also is known as the *water chinquapin* and *yellow water lily*. Its yellow flowers and leaves are on stout stalks that stand two to three feet above the water. There is a large bed about 50 miles northwest of Chicago, at Grass Lake, Ill. This mass of blooming plants covers about 600 acres, and makes a wonderful sight in August. Other beds are near New York City, at Monroe, Mich., in southern California, and in the valleys of the Missouri and Mississippi rivers.

The Big Waxy Flowers of the Hindu Lotus make this water lily one of the most unusual blossoms of the streams and ponds.
J. Horace McFarland

The botanical name *Lotus* belongs to a genus of the pea family. There are about 80 species. The flowers are white, yellow, red, or purple, and have a shape and size resembling pea flowers.

Scientific Classification. The Egyptian, East Indian, and American lotuses belong to the family *Nymphaeaceae*. The Egyptian is genus *Nymphaea*, species *lotus*. The East Indian is *Nelumbo nucifera*. The American is *N. pentapetala*. The genus *Lotus* is classified as a member of the family *Leguminosae*. GEORGE H. M. LAWRENCE

See also FLOWER (National Flowers; Flowers in Art and Literature); TREFOIL.

LOTUS-EATER, called LOTOPHAGI in ancient Greek mythology belonged to a race of people who were thought to live in North Africa. It was said that their only food was the fruit and blossoms of the lotus, or jujube tree. Anyone who ate of this magical tree forgot his homeland and the ties of friendship and family. Homer's *Odyssey* describes Ulysses' encounter with the lotus-eaters, and Tennyson's poem, *The Lotus Eaters*, is based upon this story (see ODYSSEY). Today dreamers are called lotus-eaters. VAN JOHNSON

LOTZE, *LOT suh,* **RUDOLF HERMANN** (1817-1881), was a German philosopher. He published his most famous work, *Mikrokosmus*, in three volumes between 1856 and 1864. He subtitled it *Ideas for a History of Nature and Mankind.* Lotze also published a two-volume *System of Philosophy.* He was born in Saxony, Germany. He lectured on both medicine and philosophy until he became professor of philosophy at the University of Göttingen in 1844. In 1881, Lotze moved to the University of Berlin. WALTER KAUFMANN

LOUBET, ÉMILE. See FRANCE (The Third Republic).

LOUDSPEAKER, in a radio receiver, is usually a cone which sends out sound waves. It works on the same principle that a telephone receiver does, but is much larger and louder. The cone is made to vibrate by the attraction and repulsion between the magnetic field produced in a moving coil attached to the cone and a permanent magnetic field through which the coil moves. The moving coil carries the electric current caused by the incoming radio waves. As the current fluctuates, the strength of the magnet fluctuates, and the cone vibrates accordingly. It disturbs the molecules of air near it and sets sound waves in motion.

In another type of speaker an extra large diaphragm-type receiver is attached to a horn. Current from the received signal is fed to a coil of wire around a core which can be magnetized. The magnetism of the core varies in accord with the received speech or music. This attracts the magnetic diaphragm which is a disc of thin iron. It causes the diaphragm to vibrate in accordance with that speech or music. The attached horn acts as a megaphone and is used particularly in outdoor "public address" systems. PALMER H. CRAIG

See also INTERCOM.

LOUGH is the Irish name for *lake.* See IRELAND (Rivers and Lakes).

LOUGH NEAGH, *lahk NAY,* or *NAY ahk,* or **LAKE NEAGH,** is the largest lake in the British Isles. It lies in the central part of Northern Ireland. Lough Neagh has an area of 153 square miles. The banks are flat and marshy. FRANCIS H. HERRICK

Louis of France

Ewing Galloway

Louis IX Dispensed Justice under an oak tree in a forest near Paris. His French subjects loved him for his fairness to everyone. The Roman Catholic Church canonized Louis in 1297.

LOUIS, *LOO is, LOU ih,* or *LWEE,* is the name of many famous French kings. The name means *famous warrior*, a characteristic most of the early kings of France possessed. Their efforts to build up an absolute monarchy reached a climax under Louis XIV. Later reigns were marked by a growing dissatisfaction among the common people.

Louis I (778-840), called THE PIOUS, was king of the Franks and Holy Roman Emperor. In 814, he succeeded his father, Charlemagne. In 817, he arranged for the succession after his death by dividing the empire among his three sons. After his first wife died, Louis married again, and a fourth son, Charles, was born in 823. Louis redivided his empire in 829 in order to give Charles a share. The older sons resented the new division and revolted. Louis was removed from the throne in 833, but was restored the next year. The bitter struggle between his sons continued until Louis died in 840.

Between that time and the accession of Louis IX in 1226, the seven kings of France who bore this name generally ruled only a few years, often in hectic circumstances. Exceptions were Louis VI, the Fat, who held the throne from 1108 to 1137 and Louis VII, who reigned from 1137 to 1180.

Louis IX (1214-1270), or **Saint Louis,** the leader of two crusades, was the son of Louis VIII and Blanche of Castile (1187?-1252). He came to the throne when he was 12, with his mother as regent. Under her training, he became a pious, unselfish ruler. He fought a war with Henry III of England, who at that time ruled part of France. This war ended in 1259 when the two kings signed the Treaty of Paris. Louis increased royal power

Brown Bros.

Louis XIV built the magnificent palace at Versailles.

Brown Bros.

Louis XV plunged his country deeply into debt.

Brown Bros.

Louis XVI was executed during the Revolution.

Culver

Louis XVIII ruled France after Napoleon's defeat in 1814.

at the expense of the nobles, but he won their respect by being fair and just.

In 1248, Louis led a crusade to the Holy Land. He was defeated in Egypt and taken prisoner. The Moslems released him after he agreed to pay a large ransom. Louis led another crusade in 1270, but died in northern Africa when a plague broke out in his army. He was considered an ideal ruler. Even his enemies admired him for his fairness. Louis was *canonized*, or made a Saint, by Pope Boniface VIII in 1297. See CRUSADES.

Louis XI (1423-1483), the son of Charles VII, was known as "the terrible king." While he was still *dauphin*, or crown prince, he plotted against his father. Once he was exiled, and once he had to flee for his life. When he came to the throne in 1461, he set out to break the power of the great nobles, who were almost independent of royal control. Charles the Bold, Duke of Burgundy, led the nobles. After Charles the Bold was killed in battle in 1477, Louis seized most of his territory. Later, the king added Provence, Maine, and Anjou to the royal domain.

Louis used cruel methods to keep his power. He made and broke laws as he pleased and levied taxes at will. But he strengthened the government, encouraged art and learning, promoted industry and agriculture, opened roads and canals, and made it easier for the poor to obtain justice.

Louis XII (1462-1515), called THE FATHER OF HIS PEOPLE, was the son of Charles, Duke of Orléans (see ORLÉANS). He came to the throne in 1498, succeeding Charles VIII, his distant cousin. He married Charles' widow, Anne of Brittany. France prospered under Louis XII, even though he carried on many wars. The king invaded Italy because he claimed Milan, but he was driven out in 1512. The next year, Henry VIII of England defeated Louis in the Battle of the Spurs.

Louis XIII (1601-1643) came to the throne in 1610 after the assassination of his father, Henry IV. His mother, Marie de' Medici, acted as regent until 1617. Cardinal Richelieu served as the chief minister and real ruler of France from 1624 until he died in 1642. He destroyed the political power of the Protestant Huguenots, centralized authority in the hands of the king, and made France an absolute monarchy (see RICHELIEU, CARDINAL). During this period, France fought in the Thirty Years' War (see THIRTY YEARS' WAR).

Louis XIV (1638-1715), called THE GRAND MONARCH or LOUIS THE GREAT, was five years old when he succeeded his father, Louis XIII. His 72-year reign was the longest in modern European history. He was an outstanding example of the absolute monarch. He is said to have boasted, "*L'état c'est moi*" ("I am the State"). These words express the spirit of a reign in which the king held all political authority (see DIVINE RIGHT OF KINGS).

The king's mother, Anne of Austria, acted as regent until 1661. Cardinal Mazarin served as her chief minister. In 1648, the Thirty Years' War came to an end. This war strengthened France and weakened Austria and the Hapsburgs. But Mazarin was unpopular in France, and his policies led to several years of civil war in a revolt called the *Fronde* (see FRONDE; MAZARIN, JULES CARDINAL). Twice Mazarin had to flee from Paris, but finally in 1653 he put down the rebellion. The failure of the revolt strengthened the king's authority over the nobles.

When Mazarin died in 1661, Louis declared that he would be his own chief minister. His education had been neglected, but he was shrewd in choosing wise counselors. The greatest of his ministers was Jean Colbert, who reorganized French finance and promoted economy and industry (see COLBERT, JEAN BAPTISTE).

Louis encouraged writers and artists, and played a part in the development of French literature. Historians often call the 1600's in France "the Century of Louis XIV."

Louis fought four major wars. His great aim was to make himself supreme in Europe. As a start, he hoped to conquer all the land west of the Rhine River. He gained several important territories, but was always checked by the alliances that other countries formed against him. In the War of the Spanish Succession, England took an important part in defeating him. This war, which ended in 1714, shortly before Louis died, left France exhausted and weakened.

Louis married Marie Thérèse of Spain in 1660. But his mistresses influenced him more than she did. The most important of these was Madame de Maintenon (see MAINTENON, MARQUISE DE). He secretly married her after Marie Thérèse died in 1683. Madame de Maintenon was probably partly responsible for Louis' harsh treatment of the French Protestants, who were called *Huguenots*. For nearly 100 years, they had enjoyed religious toleration and civil rights under the Edict of Nantes. In 1685, Louis revoked this edict (see HUGUENOTS; NANTES, EDICT OF). The government persecuted the Huguenots savagely in an effort to compel them to change their religion. Perhaps 200,000 Huguenots fled from the country. France suffered when the Huguenots left, because among them were many of the most prosperous and industrious persons in the country.

After 1685, Louis' reign was less glorious than it had been in the early years. After Colbert died, the country was plunged into debt by wars. Louis built a magnificent palace at Versailles. He and his court lived there in luxury, while many of the people lived in poverty. The extravagance of court life added to France's financial problems. Louis made the nobles live at Versailles instead of on their provincial estates. France became a nation of absentee landlords who had no contact with their tenants. This condition was one of the causes of the French Revolution. Yet, under Louis, France ranked above all other nations in art, in literature, in war, and in statesmanship. After Louis died, French political influence in Europe declined.

Louis XV (1710-1774), the great-grandson of Louis XIV, came to the throne at the age of five. Philip, Duke of Orléans, a relative of the king, served as regent. Louis was declared of age in 1723. Soon after, the Duke of Orléans died, and the Duke of Bourbon became the chief minister. In 1726, the king's tutor, Cardinal André Hercule de Fleury, became the real ruler. Under his government, financial conditions improved greatly, and France showed signs of economic recovery.

When Fleury died in 1743, the king announced that he would rule without a minister, as Louis XIV had done. But he was weak and pleasure-loving. A series of mistresses and court favorites dominated him. For 20 years, Madame de Pompadour dictated policies and appointed ministers (see POMPADOUR, MARQUISE DE). She was followed by Madame Du Barry (see DU BARRY, MADAME). The favorites and mistresses looted the treasury, and France's financial disorder grew steadily worse.

In 1725, Louis married Maria Leszczyńska, daughter of Stanislas I, the exiled king of Poland. France fought the War of the Polish Succession in a vain attempt to restore Stanislas to his throne. France won Lorraine in this war, but gained nothing in the War of the Austrian Succession (see SUCCESSION WARS). In the Seven Years' War, which ended in 1763, France lost its colonies in Canada and India to Great Britain. In North America, this conflict was called the French and Indian War (see FRENCH AND INDIAN WARS; SEVEN YEARS' WAR). The French hated Louis for his costly and disastrous wars and for the scandals of his personal life. His reign did much to bring on the French Revolution. Louis could see the coming disaster, but cared little. He is best remembered for his cynical remark, "After me, the deluge!"

Louis XVI (1754-1793), the grandson of Louis XV, came to the throne in 1774. He was a man of personal virtue and good intentions, but was a weak ruler. He was more interested in hunting than in public affairs. In 1770, he married the beautiful Marie Antoinette of Austria. Louis often relied on the advice of his wife. But she was unpopular because of her frivolity and her extravagance.

The young king made Robert Turgot minister of finance, and promised to support him in dealing with the public debt. Turgot met opposition when he tried to abolish some of the privileges of the nobles and higher clergy, and Louis dismissed him in 1776. The king then turned to Jacques Necker and promised to support him. The new minister also ran into opposition when he tried to make reforms, and was dismissed in 1781. By this time, the king had lost the sympathy of his people. During this period, France helped the United States gain its independence in the Revolutionary War against Great Britain. The war with Great Britain increased France's national debt.

Louis was forced to recall Necker in 1788. Necker asked the king to call the States-General, or national assembly, which had not met since 1614. The meeting of the States-General in 1789 marked the beginning of the French Revolution. Louis pretended to sympathize with the Revolution. But actually, influenced by the advice of his wife, he opposed it. He and his family were forced to move from Versailles and live under guard in the Tuileries palace in Paris (see TUILERIES).

In 1791, Louis and his family tried to flee from France, but were arrested. Radicals then seized control of the Revolutionary government. Rioters invaded the Tuileries in August, 1792, and murdered the Swiss Guard. The National Convention deposed the king and declared France a republic. Louis was tried for treason. He defended himself with dignity, but was found guilty. He was guillotined on Jan. 21, 1793. Later, Marie Antoinette met the same fate. See FRENCH REVOLUTION; MARIE ANTOINETTE.

Louis XVII (1785-1795) was king in name only, for two years after his father, Louis XVI, was guillotined in 1793. The young dauphin, or prince, was taken from his mother in 1793 and kept in prison. He died on June 8, 1795, from abuse and neglect. He became known as "the lost dauphin" because there were many stories that he was not dead. Some of these stories said that the young Louis XVII had been rescued and placed in hiding.

Louis XVIII (1755-1824), a brother of Louis XVI, became "the Restoration King" of France after the French Revolution. As the Count of Provence, he fled from France in 1791. He set up a court at Koblenz, in Germany, and issued proclamations against the Revolution. His actions enraged the French people against Louis XVI, and hastened his execution. When Louis XVII died in 1795, the Count assumed the title of king. During the period when Napoleon Bonaparte was in power, he lived in several countries in Europe. But Louis XVIII spent the later years of his exile living in England.

In 1814, after Napoleon was defeated, the allied powers gave Louis the throne. He promised to rule as a constitutional monarch. In 1815, during the "Hundred Days" of Napoleon's return, Louis was driven from his throne. But he was restored after the Battle of Waterloo. Louis proclaimed a liberal constitution, and followed moderate policies in his rule. He tried to follow a middle course between the liberals and the reactionaries, who wanted to wipe out all the changes made by the French Revolution.

RICHARD M. BRACE

See also BOURBON; CLOTHING (color pictures, Western Europe [France]); DAUPHIN; FURNITURE (Louis XIV, XV, XVI).

LOUIS II, THE GERMAN (804?-876) is often regarded as the founder of the German kingdom. After the death of his father, Louis I, in 840, he joined with one brother, Charles the Bald, to fight another, Lothair I, for control of the empire. The 843 Treaty of Verdun gave Louis all Germany east of the Rhine River.

LOUIS, JOE (1914-), held the world heavyweight boxing championship longer than any man. He turned professional in 1934, and won the title in June, 1937, by knocking out James J. Braddock in the eighth round at Chicago. Louis successfully defended his title 25 times, scoring 20 knockouts. He retired in March, 1949, and later failed in two comeback attempts. Louis combined a steady forward movement with a swift, two-fisted attack. He was born JOSEPH LOUIS BARROW in Lexington, Ala., and moved to Detroit as a child. LYALL SMITH

See also BOXING (picture).

LOUIS NAPOLEON. See NAPOLEON III.

LOUIS PHILIPPE, *LOO ih fuh LEEP* (1773-1850), was king of France from 1830 to 1848. He is often called *The Citizen King*. He was born in Paris, the eldest son of Philippe Égalité, Duke of Orléans. He sympathized with the democratic ideas of the French Revolution, and joined the national guard at the beginning of the revolt. He became a lieutenant general and took part in the battles of Valmy, Jemappes, and Neerwinden. But he later became involved in a plot against the republic and had to leave France.

Historical Pictures Service

Louis Philippe

In 1814, Louis Philippe returned to France and regained his large estates. He was proclaimed "Citizen King" of France after Charles X was forced to give up the throne in the revolution of 1830. A week later Louis Philippe was made king. During his 18-year reign, he was unpopular with all classes of Frenchmen. The *legitimists* opposed him because they were loyal to the descendants of Charles X. The Republicans disliked his autocratic ways. His reign was prosperous but uneventful. "France is bored" became a common saying.

The revolution of 1848 broke out because he refused to reform the election laws. He was forced to give up his throne, and escaped to England. ANDRÉ MAUROIS

See also CLOTHING (color picture, Western Europe [Louis Philippe]); JULY REVOLUTION; NAPOLEON III.

LOUISBOURG, Nova Scotia (pop. 1,314), is an historic town on the east coast of Cape Breton Island. It lies 20 miles southeast of Sydney. For location, see NOVA SCOTIA (color map). The French established it as a stronghold in the 1700's. The old town exists today only as ruins. The present town is a winter port, and serves as an important fishing center. Louisbourg also has a large fish-processing and cold-storage industry.

The French founded Louisbourg in 1720, and named it for King Louis XIV. They built the fortress to guard the entrance to the Saint Lawrence River. It cost so much to build it that King Louis asked if its streets were paved with gold. The Canadian government restored some of the ruins, and built a museum to house relics in 1935-1936. It established the Fortress of Louisbourg as a national park in 1941. It covers 340 acres.

First Battle of Louisbourg. The fortress became a constant threat to the British colonies. The French used it as a base from which to attack Canso in 1744. British colonists from Massachusetts then equipped a force to attack Louisbourg. Nearly 4,000 men, commanded by Colonel William Pepperell, sailed from Boston, Mass., in a fleet of 100 ships. Ten British ships-of-war, under the command of Commodore Peter Warren, arrived from the West Indies to join them. The combined forces attacked on April 30, 1745. On June 17, the fortress surrendered. In 1748, the Treaty of Aix-la-Chapelle returned Louisbourg to the French.

Second Battle of Louisbourg. The French held and strengthened Louisbourg for 10 years. In 1758, during the last French and Indian War, another battle occurred at Louisbourg. British troops led by Major General Jeffery Amherst again took the base, and destroyed most of the fortifications. THOMAS H. RADDALL

LOUISBOURG, FORTRESS OF. See CANADA (National Parks).

LOUISE, LAKE. See LAKE LOUISE.

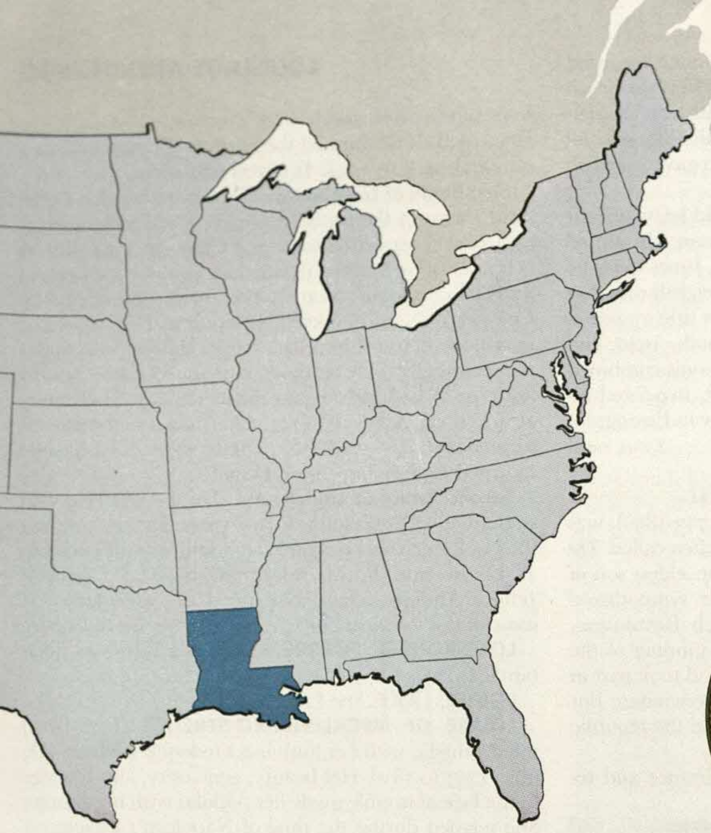
LOUISE OF MECKLENBURG-STRELITZ (1776-1810) ruled Prussia, with her husband Frederick William III, from 1797 to 1810. Her beauty, generosity, and courage in the face of trouble made her popular with her people. She reigned during the time of Napoleon's attacks on Prussia, and urged her timid husband to resist the French. After Prussian defeats at the battles of Jena and Friedland, she personally appealed to Napoleon to spare her country, but was unsuccessful. Louise was born in Hanover, Germany, the daughter of Duke Charles of Mecklenburg-Strelitz. She married in 1793. See also FREDERICK WILLIAM (III). ROBERT G. L. WAITE

LOUISIADE ARCHIPELAGO, *LOO uh zih AHD, AHR kih PEL uh goh*, lies about 100 miles off the southeastern tip of New Guinea in the Pacific Ocean. The islands are scattered over an area 160 miles by 60, in the Coral Sea. They have a population of 2,500. The group is governed by Australia as part of the territory of Papua. The four largest islands are Misima, Tagula, Joannet, and Rossell. Barrier reefs of coral form lagoons off the shores of the islands.

The rainfall is heavy in the Louisiade islands, and the vegetation is thick and green. The islanders grow coconuts and rubber, sometimes on plantations which belong to foreign owners. Gold is mined from small deposits on several of the islands.

A French navigator, Louis Antoine de Bougainville, discovered the Louisiade Archipelago in 1768 while making a voyage around the world. He found the waters around the islands a region of strong currents and rough seas, and for many years ships sailed around the islands rather than trying to find a passage through them. After 1860, copra attracted traders from Australia. Later, many laborers were recruited in the islands to work on plantations in Australia.

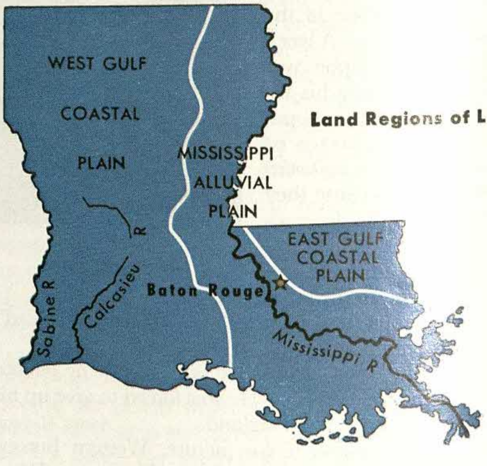
During World War II, several important naval engagements took place between Allied and Japanese forces in the waters off the islands during the Allied campaign to recapture New Guinea. EDWIN H. BRYAN, JR.



LOUISIANA

The Pelican State

The State Seal



Land Regions of Louisiana

LOUISIANA, *loo* EE *zih AN ah,* a Southern State, lies on the Gulf of Mexico at the mouth of the Mississippi River. The explorer Robert Cavelier, Sieur de la Salle, claimed the Mississippi Valley in 1682, and named it Louisiana in honor of Louis XIV of France. The early French and Spanish settlers became known as *Creoles.* As a result, Louisiana is often called THE CREOLE STATE. Baton Rouge is the capital, and New Orleans is the largest city.

Louisiana is also called THE BAYOU STATE, because of the hundreds of sluggish streams, called *bayous,* that wind through the marshes and lowlands of the southern section. Tangled marsh grasses and cypress trees draped with Spanish moss grow between the bayous and lakes. Eastern brown pelicans live throughout the bayou region, giving Louisiana still another nickname, THE PELICAN STATE. North of the coastal marshes, the land rises gently through green prairies and piney flatwoods to forest-clad hills in the north.

The busy waterway of the Mississippi River has made Louisiana an important trade center for hundreds of years. Traders paddled canoes on the Mississippi in colonial days. During the 1800's, river steamboats replaced the canoes. Today, powerful towboats push barges along the river. Ocean-going freighters and passenger ships from all parts of the world travel up the Mississippi to load and unload at New Orleans and Baton Rouge. New Orleans ranks among the highest U.S. cities in the annual amount of cargo shipped through its port.

The state has rich natural resources. Large crops of cotton, rice, and sweet potatoes come from its plantations and farms. Louisiana won the nickname THE SUGAR STATE because it grows so much sugar cane. Lonely fur trappers of the swamps and woodlands gather more fur-bearing animals than those of any other state or Canadian province. Forest industries cut millions of dollars worth of lumber and pulpwood from the forests that cover about half the state. Louisiana fishermen catch the nation's largest haul of shrimp. Vast supplies of petroleum formed the basis of a great industrial boom that began during World War II.

Louisiana's natural beauty and old-world charm attract millions of tourists each year. People from all parts of the United States travel to New Orleans for the city's great carnival, the Mardi Gras, in February or March. Tourists enjoy listening to New Orleans-style jazz in cafés along Bourbon Street, in the area that is often called the *Cradle of Jazz*. Stately plantation homes stand amid fields of cotton or sugar cane in several sections. Descendants of the Acadians who moved from Nova Scotia to Louisiana in the late 1700's still live in the bayou country. Henry Wadsworth Longfellow told of these people in his poem *Evangeline*, and people sometimes call the Bayou Teche region the *Evangeline Country*.

Many of the people have French ancestors, and the French language is still spoken in many regions. Louisiana is the only state that bases many of its laws on the *Code Napoléon*, the laws Napoleon Bonaparte introduced in France. The units of local government in Louisiana are called *parishes* instead of *counties*. The idea of parishes developed from the Roman Catholic Church districts organized by Spanish colonial governors.

For the relationship of Louisiana to other states in its region, see SOUTHERN STATES.

The Land and Its Resources

Location and Size. Louisiana covers 48,523 square miles at the southern end of the Mississippi Valley. Texas borders Louisiana on the west, Arkansas forms the northern border, and Mississippi lies to the east. The Gulf of Mexico forms the southern boundary. The *Color Map* shows that Louisiana is shaped like a boot.

Land Regions. Louisiana has three main land regions: (1) the East Gulf Coastal Plain, (2) the Mississippi Alluvial Plain, and (3) the West Gulf Coastal Plain.

The East Gulf Coastal Plain covers the area east of the

FACTS IN BRIEF

Capital: Baton Rouge (since 1882). *Earlier Capitals:* New Orleans (1812-1830); Donaldsonville (1830-1831); New Orleans (1831-1850); Baton Rouge (1850-1862); Opelousas (1862-1863); Shreveport (1863-1865); New Orleans (1865-1882).

Government: *Congress*—U.S. Senators, 2; U.S. Representatives, 8. *Electoral votes*, 10. *State Legislature*—senators, 39; representatives, 101. *Parishes* (counties), 64. *Voting Age*, 21 years.

Area: 48,523 square miles (including 3,417 square miles of inland water), 31st in size among the states. *Greatest distance:* (east-west) 313 miles; (north-south) 281 miles. *Coast line*, 397 miles.

Elevation: *Highest*, Driskill Mountain, 535 feet above sea level; *Lowest*, 5 feet below sea level at New Orleans.

Population: 3,257,022 (1960), 20th among the states. *Density*, 67 persons to the square mile. *Distribution*, urban, 63 per cent; rural, 37 per cent.

Chief Products: *Agriculture*, cotton, rice, sugar cane, sweet potatoes, tobacco, vegetables. *Manufacturing and Processing*, carbon black, chemicals, food products, gasoline, lumber, paper pulp. *Mining*, natural gas, petroleum, salt, sulfur. *Fishing Industry*, blue crabs, menhaden, oysters, shrimp.

Statehood: Apr. 30, 1812, the 18th state.

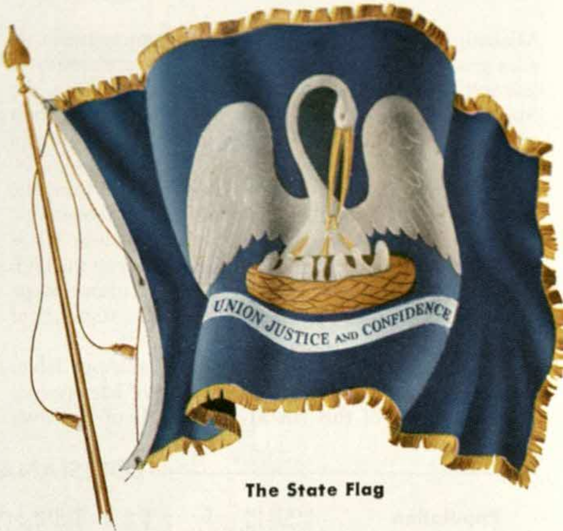
State Seal: A mother pelican, feeding and protecting her brood, symbolizes the state's role as the protector of its resources and people. Adopted in 1902.

State Flag: The pelican symbol from the state seal forms the center of a dark blue field. The white ribbon below it bears the state motto. Adopted in 1912.

State Motto: Union, Justice, and Confidence.

State Song: "Song of Louisiana," words and music by Vashti Robertson Stopher.

Flag, flower, and bird illustrations, courtesy of Eli Lilly and Company



The State Flag

The State Flower
Magnolia

The State Bird
Eastern Brown Pelican

Mississippi River and north of Lake Pontchartrain. It rises gradually from marshes in the west and south to low rolling hills in the north. Until the late 1700's, the Spaniards claimed most of this region as part of their territory of Florida. The parishes in the region are still called "the Florida parishes."

The Mississippi Alluvial Plain sweeps south from the Arkansas boundary to the Gulf of Mexico. A broken line of ridges and hollows parallels the Mississippi River as it winds through the plain. Louisianians call the high fields atop these ridges *frontlands*. The frontlands slope away from the river to *backlands*, or great stretches of silt and clay.

Through thousands of years, the Mississippi River has carried tons of silt down to the Gulf of Mexico (see Silt). Deposits of this silt at the mouth of the river formed the Mississippi Delta, which covers more than 15,000 square miles. Many bayous and low islands dot the Delta, which has Louisiana's most fertile soil.

The West Gulf Coastal Plain includes all Louisiana west of the Mississippi Alluvial Plain. Marshes stretch inland from the Gulf of Mexico for about 20 miles. Low sand ridges, called *barrier beaches*, shield the marshes from the gulf. Large rounded mounds, or *land islands*, rise as high as 200 feet above the marshes. Great deposits of salt lie under these islands. Pools of natural gas and petroleum are found trapped along the sides of the salt deposits. The gently rolling Louisiana Prairies stretch roughly from Opelousas to Lake Charles. They are about 60 miles wide.

From Evangeline and Beauregard parishes, the land slowly rises northwest to Arkansas. The state reaches its greatest heights in the Western Uplands, between the Ouachita and Sabine rivers. Driskill Mountain, rising

LOUISIANA (Map Index)

Population

3,257,022	1960
2,683,516	1950
2,363,880	1940

Physical Features

Amite R.	D 5
Anacoco Lake	C 2
Atchafalaya Basin	D 4
Atchafalaya Bay	E 4
Atchafalaya R.	D 4
Au Fer, Pt.	E 4
Aux Chene, R.	C 7
Barataria Bay	E 6
Barataria, Bayou	C 7
Bayou Bodcau Reservoir	B 2
Beckwith Creek	D 2
Belle R.	C 5
Big Corney Creek	B 3
Big Creek	B 4
Black, Bayou	E 5
Black Lake	C 2
Black Lake Bayou	B 2
Black R.	C 4
Blind R.	B 6
Blue, Bayou	E 5
Blue Buck Pt.	E 2
Boeuf, Bayou	D 3
Boeuf R.	B 4
Bogue Chitto (R.)	D 5
Bonidee, Bayou	B 4
Bonnet Carré Spillway and Floodway	B 7
Breton Isl.	E 6
Breton Sound	E 6
Bundick Creek	D 2
Caddo Lake	B 1
Caillou Bay	E 5
Caillou Lake	E 5
Calcasieu Lake	E 2
Calcasieu Pass	E 2
Calcasieu R.	D 2
Cannes, Bayou	D 3
Castor Creek	B 3
Catahoula Lake	C 3
Chalmette Nat. Historical Park and Cemetery	C 7
Chandeleur Is.	E 7
Chandeleur Sound	E 6
Chefuncte R.	D 5
Chene, Bayou	C 5
Cheniere Lake	B 3
Chevreuil, Bayou	C 6
Chevreuil, Pt.	E 4
Chicot Isl.	E 6
Chicot, Pt.	E 6
Chitimacha Ind. Res.	E 4
Clear Lake	C 2
Colyell Creek	B 6
Comfort, Pt.	E 6
Comite R.	D 4
Corney Lake	B 3
Cross Lake	B 2
D'Arbonne, Bayou	B 3
Dauchite Bayou	B 2
Derniere, Isle	E 5
Des Allemands, Bayou	C 6
Driskill Mtn. (Highest Point in Louisiana)	B 3
Dugdemona Bayou	B 3
Dupont, Bayou	C 7
East Cote Blanche Bay	E 4
Errol Isl.	E 7
Field Lake	E 5
Flat Lake	C 5
Freemason Is.	E 7
Grand Bayou	B 5
Grand Isl.	D 6
Grand Isl.	E 6
Grand Lake	E 3
Grand Lake	E 4
Grand Lake	E 6
Grand R.	D 4
Grand Terre Isl.	E 6
Grassy Lake	C 5
Intracoastal Waterway	E 3, E 5
Lacombe, Bayou	B 7
Lafourche, Bayou	E 5
Lake Arthur	D 3
Lake Barre	E 5
Lake Bistineau	B 2
Lake Boeuf	E 5
Lake Borgne	D 6
Lake Boudreaux	E 5
Lake Cataouatche	C 7
Lake De Cade	E 5
Lake Des Allemands	E 5
Lake Faussepointe	D 4
Lake Iatt	C 3
Lake Lery	C 8
Lake Maurepas	D 5
Lake Mechant	E 5
Lake Palourde	C 5
Lake Pontchartrain	D 5
Lake Salvador	E 5
Lake Verret	E 4
L'Anacoco, Bayou	C 2
Lighthouse Pt.	E 3
Little Lake	E 5
Little Lake Des Allemands	C 7
Little R.	C 3
Louisiana Pt.	E 2
L'Outre, Bayou	B 3
Macon, Bayou	B 4
Main Pass	E 6
Manchac, Bayou	B 5
Marsh Isl.	E 4
Mermentau R.	E 2
Mississippi Delta	E 6
Mississippi R.	C 4
Mitchell Isl.	E 6
Nezpique Bayou	D 3
North Is.	E 7
North Pass	E 6
Northeast Pass	E 6
Ouachita-Red River Rolling Lands	B 2
Ouachita R.	B 3
Petit Lake	C 8
Petite Amite R.	B 6
Raccoon Pt.	E 5
Raccourci Isl.	D 4
Red R.	C 4
Sabine Lake	E 2
Sabine Pass	E 2
Sabine R.	D 2
Saline Bayou	B 3
Saline Lake	C 3
San Patricio, Bayou	C 2
Sixmile Lake	E 4
South Pass	F 6
Southeast Pass	E 6
Southwest Pass	E 3
Southwest Pass	F 6
Tangipahoa R.	D 5
Teche, Bayou	D 4
Tensas Basin	C 4
Tensas R.	B 4
Terrebonne Bay	E 5
Terrebonne, Bayou	E 5
Tickfaw R.	D 5
Tigre Pt.	E 3
Timbalier Bay	E 5
Timbalier Isl.	E 5
Vermilion Bay	E 3
Vermilion R.	E 3
Wallace Lake	B 2
West Bay	E 6
West Cote Blanche Bay	E 4
West Pearl R.	D 6
Whiskey Chitto Creek	D 2
White Lake	E 3
Wine Isl.	E 5

Parishes

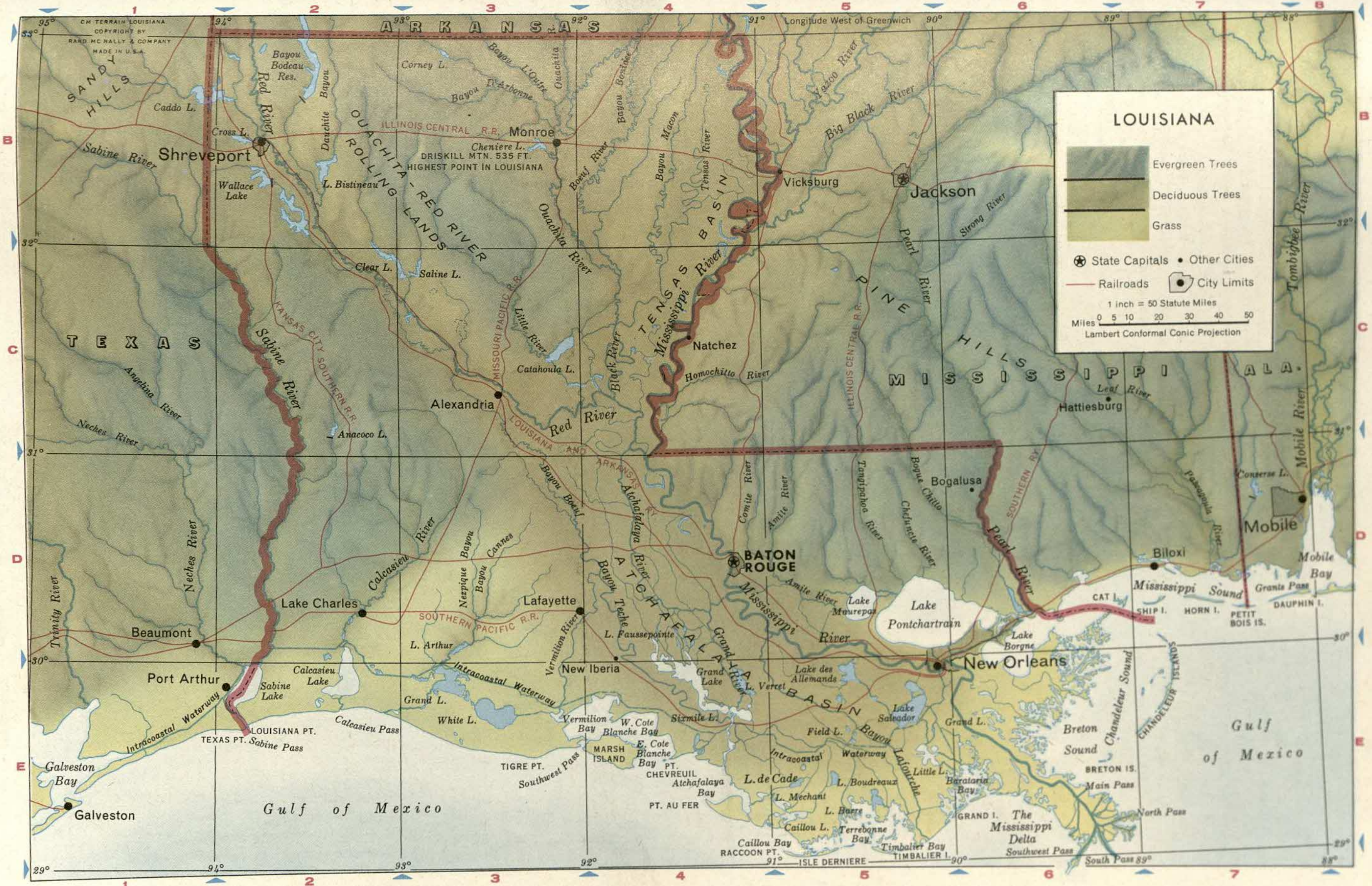
Acadia, 49,931	D 3
Allen, 19,867	D 3
Ascension, 27,927	D 5
Assumption, 17,991	E 4
Avoyelles, 37,606	C 3
Beauregard, 19,191	D 2
Bienville, 16,726	B 2
Bossier, 57,622	B 2
Caddo, 223,859	B 2
Calcasieu, 145,475	D 2
Caldwell, 9,004	B 3
Cameron, 6,909	E 2
Catahoula, 11,421	C 4
Claiborne, 19,407	B 2
Concordia, 20,467	C 4
De Soto, 24,248	B 2
East Baton Rouge, 230,058	D 4
East Carroll, 14,433	B 4
East Feliciana, 20,198	D 4
Evangeline, 31,639	D 3
Franklin, 26,088	B 4
Grant, 13,330	C 3
Iberia, 51,657	E 4
Iberville, 29,939	D 4
Jackson, 15,828	B 3
Jefferson, 208,769	E 5
Jefferson Davis, 29,825	D 3
Lafayette, 84,656	D 3
Lafourche, 55,381	E 5
La Salle, 13,011	C 3
Lincoln, 28,535	B 3
Livingston, 26,974	D 5
Madison, 16,444	B 4
Morehouse, 33,709	B 4
Natchitoches, 35,653	C 2
Orleans, 627,525	E 6
Ouachita, 101,663	B 3
Plaquemines, 22,545	E 6
Pointe Coupee, 22,488	D 4
Rapides, 111,351	C 3
Red River, 9,978	B 2
Richland, 23,824	B 4
Sabine, 18,564	C 2
St. Bernard, 32,186	E 6
St. Charles, 21,219	E 5
St. Helena, 9,162	D 5
St. James, 18,369	D 5
St. John the Baptist, 18,439	D 5
St. Landry, 81,493	D 3
St. Martin, 29,063	D 4
St. Mary, 48,833	E 4
St. Tammany, 38,643	D 5
Tangipahoa, 59,434	D 5
Tensas, 11,796	B 4
Terrebonne, 60,771	E 5
Union, 17,624	B 3
Vermilion, 38,855	E 3
Vernon, 18,301	C 2
Washington, 44,015	D 5
Webster, 39,701	B 2
West Baton Rouge, 14,796	D 4
West Carroll, 14,177	B 4
West Feliciana, 12,395	D 4
Winn, 16,034	B 3

Cities

Abbeville, 10,414	°E 3
Abita Springs, 655	B 7, D 5
Acme, 50	C 4
Acy, 30	B 6
Ada, 495	B 2
Addis, 590	D 4
Akers, 150	B 7, D 5
Albany, 557	A 6
Alco, 40	C 2
Alden Bridge, 200	B 2
Alexandria, 40,279	°C 3
Alexandria Southwest,* 2,782	C 3
Allemands, 1,167	C 6, E 5
Alsen,* 500	D 4
Alto, 100	B 4
Alton, 60	B 8
Ama, 600	C 7
Amelia, 950	C 5
Amite, 3,316	°D 5
Anacoco, 300	C 2
Anandale,* 2,827	C 3
Angie, 254	D 6
Ansley, 400	B 3
Arabi, 5,000	C 7
Arcadia, 2,547	°B 3
Archibald, 140	B 4
Arizona, 50	B 3
Arnaudville, 1,184	D 4
Ashland, 300	B 2
Ashland, 150	E 5
Atchafalaya, 10	D 4
Athens, 406	B 2
Atlanta, 300	C 3
Avery Island, 650	E 4
Avondale, 100	C 4
Bains, 85	D 4
Baker, 4,823	D 4
Baldwin, 1,548	E 4
Ball, 350	C 3
Bancroft, 100	D 2
Barataria, 900	C 7, E 5
Barton, 200	B 5
Basile, 1,932	D 3
Baskin, 238	B 4
Bastrop, 15,193	°B 4
Baton Rouge, 152,419	°B 5, D 4
Bawcomville, 1,500	B 3
Bayou Cane,* 3,173	E 5
Bayou Chene	D 4
Bayou Chicot, 50	D 3
Bayou Current, 75	D 4
Bayou Goula, 750	B 5, D 4
Bayou Sorrel,* 300	D 4
Belcher, 400	B 2
Bell City, 250	D 3
Belle Alliance, 100	B 5
Belle Chasse, 700	C 7, E 6
Bellerose, 300	B 5, D 4
Belmont, 50	C 2
Benson, 100	C 2
Bentley, 200	C 3
Benton, 1,336	°B 2
Bernice, 1,641	B 3
Bertrandville, 100	C 7, E 6
Berwick, 3,880	C 5, E 4
Bethany	B 1
Bienville, 305	B 3
Big Cane, 100	D 4
Blanchard, 500	B 2
Bogalusa, 21,423	D 6
Bolinger, 100	B 2
Bonfouca, 60	B 8
Bonita, 574	B 4
Book, 20	C 4
Boothville, 550	E 6
Bordelonville, 420	C 4
Bosco, 100	B 3
Bossier City, 32,776	B 2
Boudreaux, 300	E 5
Bourg, 900	E 5
Boutte, 155	C 6
Boyce, 1,094	C 3
Braithwaite, 375	C 7
Branch, 100	D 3
Breaux Bridge, 3,303	D 4
Bridge City, 2,500	C 7
Bristol, 65	D 3
Brittany, 20	B 6
Broadmoor,* 650	D 4
Brookwood,* 750	B 2
Broussard, 1,600	D 4
Brownfields,* 750	D 4
Brownsville,* 3,000	B 3
Brusly Landing, 544	B 5
Bryceland, 89	B 3
Bunkie, 5,188	D 3
Buras, 4,000	E 6
Burnside, 20	B 5
Burr Ferry, 100	C 2
Burrwood, 400	F 6
Cade, 500	D 4
Caffery,* 350	E 4
Calcasieu, 100	C 3
Calhoun, 600	B 3
Calvin, 232	C 3
Cameron, 950	°E 2
Campti, 1,045	C 2
Cancienne, 25	C 5
Carencro, 1,519	D 3
Carlisle, 25	C 7
Carville, 950	B 5
Caspiana, 250	B 2
Castor, 142	B 2
Catahoula, 600	D 4
Cecilia, 400	D 4
Center Point, 250	C 3
Centerville, 537	E 4
Chacahoula, 50	C 5, E 5
Chalmette, 10,000	°C 7, E 6
Charenton, 650	E 4
Chase, 65	B 4
Chataignier, 550	D 3
Chatham, 758	B 3
Chauvin, 950	E 5
Cheneyville, 1,037	C 3
Chestnut, 50	B 2
Choudrant, 465	B 3
Choupique	D 2
Church Point, 3,606	D 3
Cinclare, 150	B 5
Claiborne,* 600	D 5
Clarence, 286	C 2
Clarks, 940	B 3
Clay, 150	B 3
Clayton, 882	C 4
Clinton, 1,568	°D 4
Cloutierville, 225	C 3
Colfax, 1,934	°C 3
Collinston, 497	B 4
Colquitt, 40	B 3
Columbia, 1,021	°B 3
Columbus	C 2
Convent, 400	°B 6, D 5
Converse, 291	C 2
Corbin, 100	A 6
Coteau,* 500	E 5
Cotton Valley, 1,145	B 2
Cottonport, 1,581	D 3
Couchwood, 200	B 2
Coushatta, 1,663	°B 2
Covington, 6,754	°B 7, D 5
Creole, 150	E 2
Creston, 110	C 2

°County Seat.
*Does not appear on the map; key shows general location.

*Population of metropolitan area, including suburbs.
Source: Latest available census figures.


LOUISIANA
Evergreen Trees
Deciduous Trees
Grass
State Capitals
Other Cities
Railroads
City Limits
1 inch = 50 Statute Miles
Miles 0 5 10 20 30 40 50
Lambert Conformal Conic Projection
CM TERRAIN LOUISIANA
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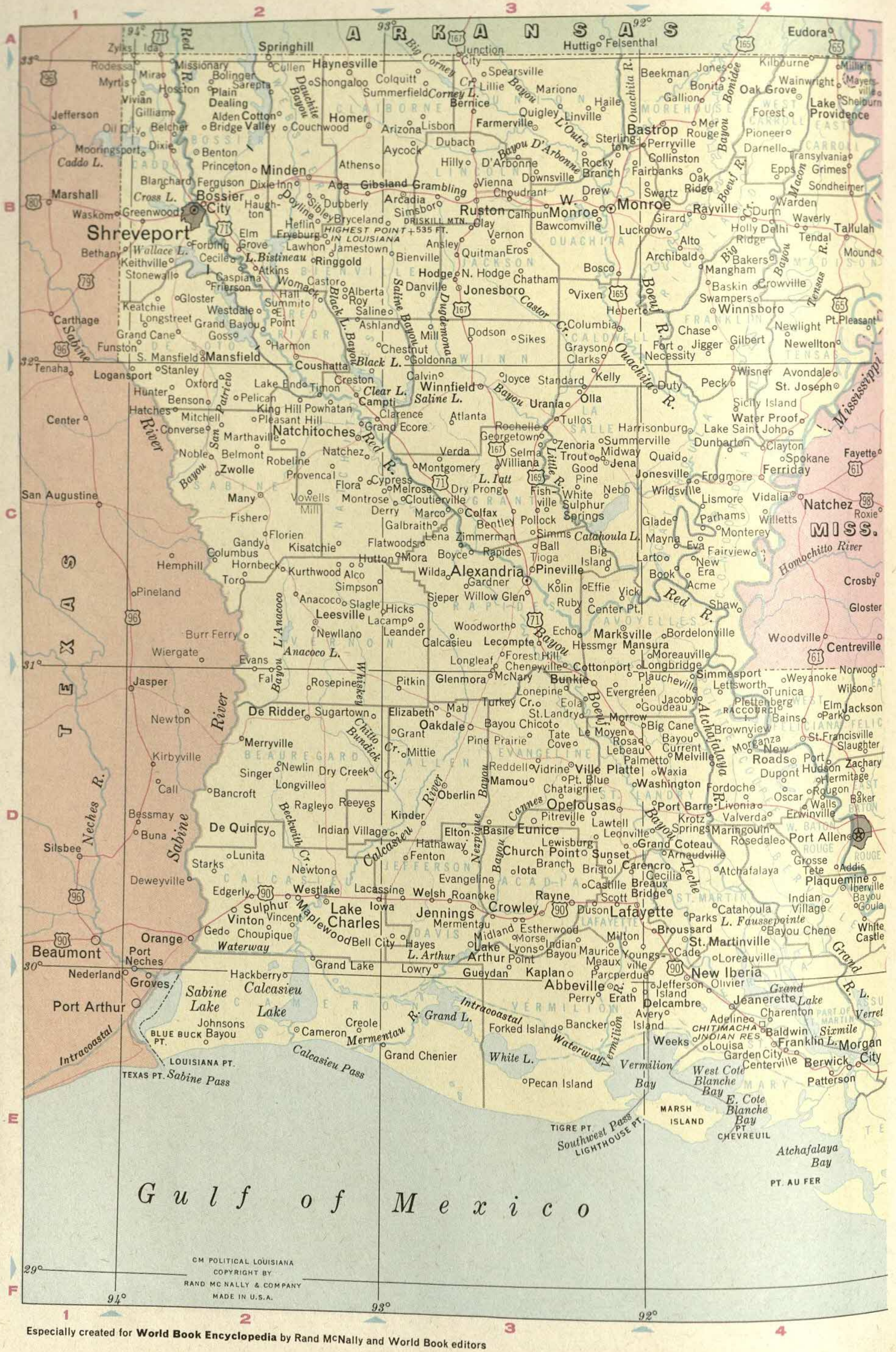
Longitude West of Greenwich
A R K A N S A S
T E X A S
M I S S I S S I P P I
A L A.
SANDY HILLS
OUACHITA - RED RIVER ROLLING LANDS
TENSAS BASIN
PINE HILLS
ATCHAFALAYA BASIN
DRISKILL MTN. 535 FT.
HIGHEST POINT IN LOUISIANA
Shreveport
Monroe
Vicksburg
Jackson
Natchez
Alexandria
Hattiesburg
Bogalusa
Mobile
Biloxi
BATON ROUGE
New Orleans
Lafayette
New Iberia
Lake Charles
Beaumont
Port Arthur
Galveston
Caddo L.
Cross L.
Wallace Lake
Bayou Bodcau Res.
Red River
Dauchite Bayou
L. Bistineau
Corney L.
Bayou D'Arbonne
Bayou L'Outre
Ouachita
Bayou Bartholomew
Boeuf River
Bayou Macon
Tensas River
Cheniere L.
Clear L.
Saline L.
Little River
Catahoula L.
Ouachita River
Black River
Mississippi River
Yazoo River
Big Black River
Strong River
Pearl River
Homochitto River
Leaf River
Tombigbee River
Mobile River
Pascagoula River
Conecuh L.
Sabine River
Angelina River
Neches River
Trinity River
Anacoco L.
Calcasieu River
Bayou Nezpique
Bayou Cannes
Bayou Boeuf
Atchafalaya River
Bayou Teche
Grand River
Grand Lake
L. Fausse Pointe
Vermilion River
Comite River
Amite River
Tangipahoa River
Bogue Chitto
Chefuncte River
Lake Maurepas
Lake Pontchartrain
Lake Borgne
Lake des Allemands
L. Verret
Lake Salvador
Bayou Lafourche
Intracoastal Waterway
Sixmile L.
Field L.
Grand L.
Little L.
L. Boudreaux
L. Mechant
L. de Cade
L. Barre
Caillou L.
Terrebonne Bay
Timbalier Bay
Caillou Bay
Barataria Bay
The Mississippi Delta
Southwest Pass
South Pass
Main Pass
North Pass
BRETON IS.
Breton Sound
Chandeleur Sound
CHANDELEUR ISLANDS
GRAND I.
TIMBALIER I.
ISLE DERNIERE
RACCOON PT.
PT. AU FER
Atchafalaya Bay
PT. CHEVREUIL
E. Cote Blanche Bay
W. Cote Blanche Bay
MARSH ISLAND
Vermilion Bay
Southwest Pass
TIGRE PT.
White L.
Grand L.
L. Arthur
Calcasieu Lake
Calcasieu Pass
Sabine Lake
LOUISIANA PT.
TEXAS PT.
Sabine Pass
Galveston Bay
Gulf of Mexico
Mississippi Sound
CAT I.
SHIP I.
HORN I.
PETIT BOIS IS.
DAUPHIN I.
Grants Pass
Mobile Bay
ILLINOIS CENTRAL R.R.
KANSAS CITY SOUTHERN R.R.
MISSOURI PACIFIC R.R.
LOUISIANA AND ARKANSAS RY.
SOUTHERN PACIFIC R.R.
SOUTHERN RY.
33°
32°
31°
30°
29°
95°
94°
93°
92°
91°
90°
89°
88°
1
2
3
4
5
6
7
8
B
C
D
E



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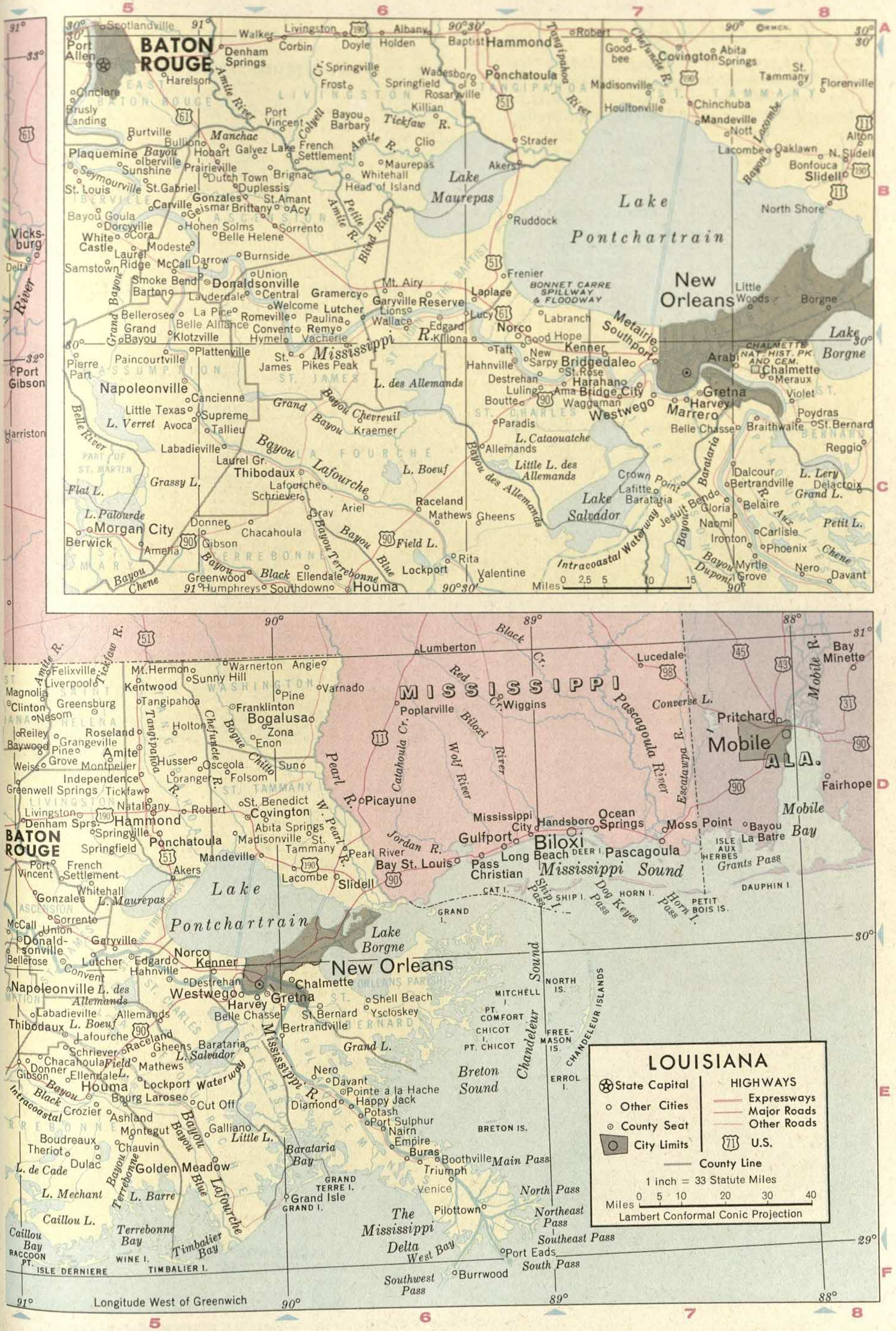
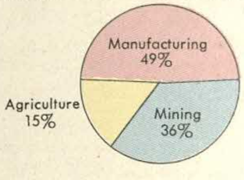

5
6
7
8
A
B
C
D
E
F
BATON ROUGE
Port Allen
Scotlandville
Denham Springs
Harelson
Walker
Livingston
Corbin
Albany
Doyle
Holden
Baptist
Hammond
Robert
Goodbee
Covington
Abita Springs
St. Tammany
Florenville
Springville
Frost
Springfield
Wadesboro
Ponchatoula
Rosaryville
Killian
Madisonville
Houltonville
Chinchuba
Mandeville
Nott
Alton
Lacombe
Oaklawn
N. Slidell
Bonfouca
Slidell
North Shore
Cinclare
Brusly Landing
Port Vincent
Bayou Barbary
Tickfaw R.
Clio
Strader
Burtville
Bullion
Manchac
Hobart
Galvez
Lake French Settlement
Maurepas
Whitehall
Head of Island
Akers
Lake Maurepas
Lake Pontchartrain
Plaquemine
Iberville
Sunshine
Seymourville
St. Louis
Prairieville
Dutch Town
Brignac
St. Gabriel
Duplessis
Gonzales
St. Amant
Carville
Geismar
Brittany
Acy
Bayou Goula
Dorcyville
Hohen Solms
Sorrento
White Castle
Cora
Belle Helene
Ruddock
Modeste
Laurel Ridge
McCall
Darrow
Burnside
Samstown
Smoke Bend
Union
Donaldsonville
Barton
Lauderdale
Central
Welcome
Gramercy
Mt. Airy
Garyville
Reserve
Laplace
Frenier
BONNET CARRE SPILLWAY & FLOODWAY
New Orleans
Little Woods
Borgne
Bellerose
Grand Bayou
Belle Alliance
La Pice
Romeville
Convent
Lutcher
Paulina
Remy
Lions
Wallace
Edgard
Lucy
Norco
Labranch
Metairie
Southport
Lake Borgne
Klotzville
Hymel
Vacherie
Killona
Good Hope
Kenner
Bridgedale
Arabi
CHALMETTE NAT. HIST. PK. AND CEM.
Chalmette
Meraux
Plattenville
Paincourtville
Pierre Part
St. James
Mississippi R.
Pikes Peak
Taft
New Sarpy
St. Rose
Hahnville
Destrehan
Luling
Ama
Harahan
Bridge City
Gretna
Harvey
Marrero
Westwego
Waggaman
Boutte
Violet
Poydras
St. Bernard
Braithwaite
Belle Chasse
Napoleonville
Cancienne
Supreme
Tallieu
Little Texas
L. Verret
Avoca
L. des Allemands
Bayou Chevreuil
Kraemer
Grand Bayou
Paradis
L. Cataouatche
Allemands
Reggio
Belle River
Labadieville
Laurel Gr.
Thibodaux
Bayou Lafourche
Lafourche
Schriever
L. Boeuf
Little L. des Allemands
Bayou des Allemands
Crown Point
Lafitte
Barataria
Dalcour
Bertrandville
L. Lery
Delacroix
Grand L.
Flat L.
Grassy L.
L. Palourde
Morgan City
Berwick
Amelia
Donner
Chacahoula
Gibson
Gray
Ariel
Raceland
Mathews
Gheens
Lake Salvador
Jesuit Bend
Gloria
Belaire
Naomi
Carlisle
Ironton
Phoenix
Petit L.
Chene
Field L.
Bayou Blue
Bayou Terrebonne
Lockport
Rita
Valentine
Intracoastal Waterway
Bayou Dupont
Myrtle Grove
Nero
Davant
Bayou Chene
Greenwood
Black
Ellendale
Humphreys
Southdown
Houma
Miles 0 2.5 5 10 15
30°
91°
90°30′
90°
Vicksburg
Delta
River
Port Gibson
Harriston
33°
32°
31°
30°
29°
89°
88°
MISSISSIPPI
ALA.
Felixville
Liverpool
Magnolia
Clinton
Nesom
Greensburg
Reiley
Roseland
Baywood
Grangeville
Pine Grove
Amite
Weiss
Montpelier
Greenwell Springs
Independence
Tickfaw
Livingston
Denham Sprs.
Natalbany
Mt. Hermon
Kentwood
Tangipahoa
Warnerton
Sunny Hill
Angie
Varnado
Pine
Franklinton
Bogalusa
Zona
Enon
Holton
Husser
Osceola
Loranger
Folsom
Sun
St. Benedict
Lumberton
Poplarville
Wiggins
Lucedale
Converse L.
Pritchard
Mobile
Bay Minette
Fairhope
Mobile Bay
Pearl R.
Picayune
Catahoula Cr.
Wolf River
Biloxi River
Red Cr.
Black Cr.
Pascagoula River
Escatawpa R.
Mississippi City
Handsboro
Ocean Springs
Moss Point
Bayou La Batre
Gulfport
Biloxi
Pascagoula
Long Beach
Pass Christian
Bay St. Louis
Pearl River
Jordan R.
W. Pearl R.
Mississippi Sound
ISLE AUX HERBES
Grants Pass
DAUPHIN I.
DEER I.
CAT I.
SHIP I.
HORN I.
PETIT BOIS IS.
GRAND I.
Ship I. Pass
Dog Keyes Pass
Horn I. Pass
Chandeleur Sound
NORTH IS.
MITCHELL I.
PT. COMFORT
CHICOT I.
PT. CHICOT
FREE-MASON IS.
CHANDELEUR ISLANDS
ERROL I.
Breton Sound
BRETON IS.
Shell Beach
Yscloskey
Pointe a la Hache
Happy Jack
Diamond
Potash
Port Sulphur
Nairn
Empire
Buras
Boothville
Triumph
Venice
Main Pass
North Pass
Pilottown
Northeast Pass
Southeast Pass
Port Eads
South Pass
Southwest Pass
Burrwood
West Bay
The Mississippi Delta
Grand Isle
GRAND TERRE I.
Barataria Bay
Little L.
Golden Meadow
Galliano
Cut Off
Larose
Bourg
Crozier
Ashland
Montegut
Chauvin
Boudreaux
Theriot
Dulac
L. de Cade
L. Mechant
L. Barre
Caillou L.
Caillou Bay
Terrebonne Bay
Timbalier Bay
RACCOON PT.
ISLE DERNIERE
WINE I.
TIMBALIER I.
Longitude West of Greenwich
LOUISIANA
State Capital
Other Cities
County Seat
City Limits
HIGHWAYS
Expressways
Major Roads
Other Roads
U.S.
County Line
1 inch = 33 Statute Miles
Miles 0 5 10 20 30 40
Lambert Conformal Conic Projection

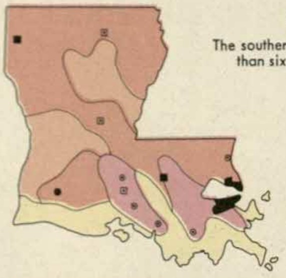
LOUISIANA

The maps and graphs on this page show the variations in rainfall, population, and growing season. They also tell the chief ways the people earn their living and the average yearly value of the state's main products.

TOTAL PRODUCTION $2,722,000,000



POPULATION

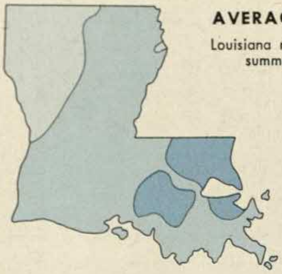


The southern part of Louisiana has fewer than six people to the square mile.

Persons to the Square Mile

- 2–6
- 6–18
- 18–45
- 45–90
- Urban Centers over 500,000
- ■ 200,000–500,000
- ● 100,000–200,000
- ⊡ 50,000–100,000
- ⊙ 20,000–50,000

AVERAGE YEARLY RAINFALL

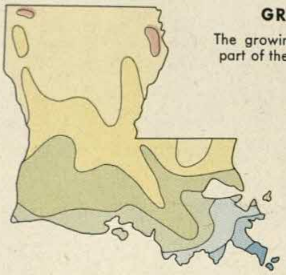


Louisiana receives slightly more rain in summer than it does in winter.

(inches)

- 40–50
- 50–60
- 60–80

GROWING SEASON



The growing season in the southeastern part of the state is over 10 months long.

Average Number of Days Without Killing Frost

- 200–220
- 220–240
- 240–260
- 260–280
- 280–300
- 300–320
- 320–340
- over 340

LOUISIANA'S LEADING PRODUCTS

Each Box ■ Represents $25,000,000 Worth of Products.

MANUFACTURING Total Value Added $1,327,000,000

Chemicals	$283,000,000
Food Processing	$228,000,000
Pulp & Paper Products	$180,000,000
Petroleum Refining	$176,000,000

AGRICULTURE Total $403,000,000

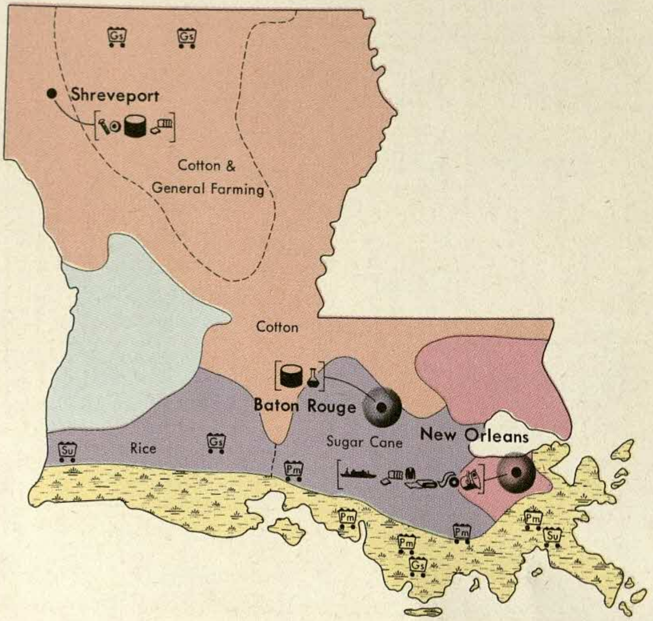
Cotton	$118,000,000
Rice	$64,000,000
Cattle	$48,000,000

MINING Total $992,000,000

Petroleum & Natural Gas	$913,000,000

All figures are based on government statistics for a 4 year period.

ECONOMIC ACTIVITY



Petroleum and natural gas account for 34 per cent of Louisiana's income.

MANUFACTURING
- Chemicals
- Food Processing
- Petroleum Refining
- Pulp & Paper Products
- Metal Products
- Transportation Equipment
- Textiles & Clothing
- Metal Processing

MINING
- Gs Natural Gas
- Pm Petroleum
- Su Sulfur

AGRICULTURE
- General Farming
- Cotton
- Special Crops & General Farming
- Fruit, Truck & General Farming
- Marshland

LOUISIANA'S CHIEF MANUFACTURING CENTERS

● $100,000,000 to $500,000,000

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Crowley, 15,617	°D 3
Crown Point, 175	C 7
Crowville, 165	B 4
Crozier, 100	E 5
Cullen, 2,194	B 2
Cut Off (part of New Orleans)	E 5
Cypress, 200	C 2
Daigleville,* 5,906	E 5
Dalcour	C 7
Danville, 75	B 3
D'Arbonne	B 3
Darnell, 65	B 4
Darrow, 400	B 5
Davant, 415	C 8, E 6
Delacroix, 650	C 8
Delcambre, 1,857	E 4
Delhi, 2,514	B 4
Delta, 111	B 5
Denham Springs, 5,991	A 5, D 5
De Quincy, 3,928	D 2
De Ridder, 7,188	°D 2
Derry, 75	C 3
Destrehan, 330	C 7, E 5
Diamond, 200	E 6
Dixie, 250	B 2
Dixie Gardens,* 400	B 2
Dixie Inn, 399	B 2
Dodson, 512	B 3
Donaldsonville, 6,082	°B 5, D 5
Donner, 300	C 5, E 5
Dorcyvillle, 400	B 5
Downsville, 150	B 3
Doyline, 1,061	B 2
Drew	B 3
Dry Creek, 50	D 2
Dry Prong, 360	C 3
Dubach, 1,013	B 3
Dubberly, 249	B 2
Dulac, 160	E 5
Dunbarton, 50	C 4
Dunn, 200	B 4
Dupont, 150	D 4
Duplessis, 150	B 5
Duson, 1,033	D 3
Dutch Bayou,* 400	D 5
Duty	C 4
East Point, 100	B 2
Echo, 350	C 3
Edgard, 750	°B 6, D 5
Edgerly, 350	D 2
Effie, 100	C 3
Egan,* 300	D 3
Elizabeth, 1,030	D 3
Ellendale, 300	C 6, E 5
Elm Grove, 300	B 2
Elton, 1,595	D 3
Empire, 450	E 6
Enon, see Zona	
Eola, 250	D 3
Epps, 411	B 4
Erath, 2,019	E 3
Eros, 176	B 3
Erwinville, 350	D 4
Estelle,* 500	E 5
Estherwood, 639	D 3
Eunice, 11,326	D 3
Eva, 80	C 4
Evangeline, 950	D 3
Evans, 100	C 2
Evergreen, 325	D 3
Fairbanks, 300	B 3
Farmerville, 2,727	°B 3
Felixville, 35	D 5
Fenton, 429	D 3
Ferguson	B 2
Ferriday, 4,563	C 4
Fisher, 300	C 2
Fishville, 150	C 3
Flatwoods, 150	C 3
Flora, 250	C 2
Florien, 496	C 2
Folsom, 225	D 5
Forbing, 500	B 2
Fordoche, 400	D 4
Forest, 160	B 4
Forest Hill, 302	C 3
Forked Island, 180	E 3
Fort Necessity, 75	B 4
Fountain Place,* 5,000	D 4
Franklin, 8,673	°E 4
Franklinton, 3,141	°D 5
French Settlement, 350	B 6, D 5
Frenier, 25	B 6
Frierson, 200	B 2
Frogmore, 85	C 4
Frost, 30	B 6
Fryeburg, 100	B 2
Funston, 50	B 2
Galbraith, 125	C 3
Galliano, 950	E 5
Gallion, 75	B 4
Garden City, 300	E 4
Gardner, 65	C 3
Garyville, 2,389	B 6, D 5
Ged, 30	D 2
Geismar, 100	B 5
Georgetown, 321	C 3
Gheens, 100	C 6, E 5
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Gibson, 280	C 5, E 5
Gilbert, 472	B 4
Gilliam, 300	B 2
Girard, 100	B 4
Glenmora, 1,447	D 3
Gloria, 5	C 7
Gloster, 250	B 2
Golden Meadow, 3,097	E 5
Goldonna, 292	B 3
Gonzales, 3,252	B 5, D 5
Good Hope (part of Norco)	B 7
Good Pine, 800	C 3
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Goudeau, 130	D 3
Grambling, 3,144	B 3
Gramercy, 2,094	B 6
Grand Bayou	B 5
Grand Cane, 322	B 2
Grand Chenier, 200	E 3
Grand Coteau, 1,165	D 3
Grand Ecore, 55	C 2
Grand Isle, 2,074	E 6
Grand Lake	D 2
Grangeville, 40	D 5
Grant, 150	D 3
Gray, 400	C 6
Grayson, 428	B 3
Greensburg, 512	°D 5
Greenwell Springs, 75	D 5
Greenwood, 500	B 2
Greenwood	C 5
Greinwich Terrace,* 2,000	D 2
Gretna, 21,967	°C 7, E 5
Grimes	B 4
Grosse Tete, 768	D 4
Gueydan, 2,156	D 3
Hackberry, 800	E 2
Hahnville, 1,297	°C 6, E 5
Haile, 160	B 3
Hall Summit, 170	B 2
Hammond, 10,563	A 6, D 5
Hammond East,* 1,462	D 5
Happy Jack, 100	E 6
Harahan, 9,275	C 7
Harelson, 150	B 5
Harmon, 80	B 2
Harrisonburg, 594	°C 4
Harvey, 10,000	C 7, E 5
Hathaway, 50	D 3
Haughton, 611	B 2
Hayes, 800	D 3
Haynesville, 3,031	B 2
Head of Island, 150	B 6
Hebert, 70	B 4
Heflin, 289	B 2
Henderson,* 500	D 4
Hessmer, 433	C 3
Hicks, 25	C 2
Highland Park (part of Monroe)	B 3
Hodge, 878	B 3
Hohen Solms, 200	B 5
Holden, 75	A 6
Holly Ridge, 300	B 4
Hollywood,* 1,750	D 2
Homer, 4,665	°B 2
Hopedale,* 720	E 6
Hornbeck, 374	C 2
Hosston, 400	B 2
Houltonville, 200	B 7
Houma, 22,561	°C 6, E 5
Husser, 35	D 5
Hutton, 50	C 2
Hymel, 250	B 6
Iberville, 150	D 4
Ida, 300	A 2
Independence, 1,941	D 5
Indian Village, 200	D 3
Iota, 1,245	D 3
Iowa, 1,857	D 2
Ironton, 150	C 7
Jackson, 1,824	D 4
Jacoby, 290	D 4
Jamestown, 140	B 2
Jarreau,* 600	D 4
Jeanerette, 5,568	E 4
Jefferson,* 35,000	E 5
Jefferson Island, 200	E 4
Jena, 2,098	°C 3
Jennings, 11,887	°D 3
Jesuit Bend	C 7
Jigger, 125	B 4
Jones, 400	B 4
Jonesboro, 3,848	°B 3
Jonesville, 2,347	C 4
Joyce, 600	C 3
Junction City, 639	A 3
Kaplan, 5,267	D 3
Keatchie, 345	B 2
Keithville, 100	B 2
Kelly, 450	C 3
Kenner, 17,037	C 7, E 5
Kentwood, 2,607	D 5
Kilbourne, 227	B 4
Killona, 650	B 6
Kinder, 2,299	D 3
King Hill, 100	C 2
Kisatchie, 30	C 2
Klotzville, 300	B 5
Kolin, 50	C 3
Kraemer, 450	C 6
Krotz Springs, 1,057	D 4
Kurthwood, 70	C 2
Labadieville, 650	C 6, E 5
Lacamp, 50	C 3
Lacassine, 200	D 3
Lacombe, 650	B 7, D 6
Lafayette, 40.400	°D 3
Lafayette Southwest,* 6,682	D 3
Lafitte, 257	C 7
Lafourche, 500	C 6, E 5
Lake Arthur, 3,541	D 3
Lake Charles, 63,392	°D 2
Lake End, 40	C 2
Lake Providence, 5,781	°B 4
Lakeside,* 1,233	C 3
Laplace, 3,541	B 6
Larose, 2,796	E 5
Larto, 125	C 4
Laurel Grove, 150	C 6
Laurel Ridge, 107	B 5
Lawhon, 100	B 2
Lawtell, 500	D 3
Leander, 75	C 3
Lebeau, 100	D 4
Lecompte, 1,485	C 3
Lee Heights,* 450	C 3
Leesville, 4,689	°C 2
Lemannville,* 400	D 5
Le Moyen, 200	D 3
Lena, 200	C 3
Leonville, 526	D 4
Lettsworth, 175	D 4
Lewisburg, 150	D 3
Lillie, 85	B 3
Linville, 50	B 3
Lions, 450	B 6
Lisbon, 229	B 3
Little Farms Park,* 500	E 5
Little Texas, 350	C 5
Liverpool, 140	D 5
Livingston, 1,183	°A 6, D 5
Livonia, 430	D 4
Lockport, 2,221	C 6, E 5
Logansport, 1,371	C 2
Longbridge, 75	C 3
Longleaf, 725	C 3
Longstreet, 283	B 2
Longville, 140	D 2
Loranger, 60	D 5
Loreauville, 655	D 4
Louisa, 100	E 4
Lowry, 35	D 3
Lucy, 725	B 6
Luling, 2,122	C 7
Lutcher, 3,274	B 6, D 5
Lyons Point, 50	D 3
Madisonville, 860	B 7, D 5
Mamou, 2,928	D 3
Mandeville, 1,740	B 7, D 5
Mangham, 521	B 4
Mansfield, 5,839	°B 2
Mansura, 1,579	C 3
Many, 3,164	°C 2
Maplewood, 2,432	D 2
Marco, 100	C 3
Maringouin, 1,168	D 4
Marion, 685	B 3
Marksville, 4,257	°C 3
Marrero, 19,000	C 7
Marthaville, 181	C 2
Mathews, 200	C 6, E 5
Maurepas, 50	B 6
Maurice, 411	D 3
Mayna, 40	C 4
McCall, 130	B 5, D 4
McNary, 250	D 3
Melrose, 200	C 3
Melville, 1,939	D 4
Mer Rouge, 853	B 4
Meraux, 500	C 7
Mermentau, 334	D 3
Merryville, 1,232	D 2
Metairie, 65.000	C 7
Midland, 500	D 3
Midway, 400	C 3
Millikin, 100	B 4
Milton, 150	D 3
Minden, 12,785	°B 2
Mira, 75	B 2
Mitchell, 300	C 2
Mittie, 15	D 3
Modeste, 250	B 5
Monroe, 52,219	°B 3
Montegut, 588	E 5
Monterey, 40	C 4
Montgomery, 866	C 3
Montpelier, 197	D 5
Montz,† 350	D 5
Mooringsport, 864	B 2
Mora, 30	C 3
Moreauville, 815	C 4
Morgan City, 13,540	C 5, E 4
Morganza, 937	D 4
Morrow, 400	D 3
Morse, 682	D 3
Moss Bluff,* 700	D 2
Mossville,* 1,500	D 2
Mound, 107	B 4
Mt. Airy, 500	B 6
Mt. Hermon, 90	D 5
Myrtis, 100	B 1
Myrtle Grove, 50	C 7
Nairn, 125	E 6
Naomi, 50	C 7
Napoleonville, 1,148	°C 5, E 4
Natalbany, 350	D 5
Natchez, 100	C 2
Natchitoches, 13,924	°C 2
Nebo, 150	C 3
Nero, 210	C 8, E 6
Nesom	D 5
New Era, 30	C 4
New Iberia, 29,062	°D 4
New Orleans, 627,525 (*868,480)	°C 7, E 5
New Roads, 3,965	°D 4
New Sarpy, 1,259	C 7
Newellton, 1,453	B 4
Newllano, 264	C 2
Noble, 206	C 2
Norco, 4,682	B 6, D 5
North Highlands,* 900	B 2
North Hodge, 680	B 3
North Shreveport,* 7,701	B 2
Norwood, 427	D 4
Oak Grove, 1,797	°B 4
Oak Ridge, 287	B 4
Oakdale, 6,618	D 3
Oaklawn, 150	B 8
Oberlin, 1,794	°D 3
Oil City, 1,430	B 2
Olivier, 400	E 4
Olla, 1,246	C 3
Opelousas, 17,417	°D 3
Oscar, 150	D 4
Oxford, 350	C 2
Paincourtville, 500	B 5
Palmetto, 430	D 4
Paradis, 800	C 6
Parhams, 35	C 4
Parks, 413	D 4
Patterson, 2,923	E 4
Paulina, 1,014	B 6
Pearl River, 964	D 6
Pelican, 250	C 2
Perry, 150	E 3
Perryville, 100	B 4
Phoenix, 400	C 7
Pierre Part, 500	C 5
Pikes Peak, 200	C 6
Pilottown, 150	E 6
Pine Grove, 150	D 5
Pine Prairie, 387	D 3
Pineville, 8,636	C 3
Pioneer, 154	B 4
Pitkin, 400	D 3
Pitreville, 30	D 3
Plain Dealing, 1,357	B 2
Plaquemine, 7,689	°B 5, D 4
Plaquemine Southwest,* 1,272	D 4
Plattenville, 300	B 5
Plaucheville, 228	D 4
Pleasant Hill, 907	C 2
Point Blue, 100	D 3
Pointe a la Hache, 600	°E 6
Pollock, 366	C 3
Ponchatoula, 4,727	B 6, D 5
Port Allen, 5,026	°B 5, D 4
Port Barre, 1,876	D 4
Port Hudson, 200	D 4
Port Sulphur, 2,868	E 6
Port Vincent, 340	B 6, D 5
Powhatan, 300	C 2
Poydras, 200	C 8
Prairieville, 150	B 5
Princeton, 250	B 2
Provencal, 570	C 2
Quitman, 185	B 3
Raceland, 3,666	C 6, E 5
Rayne, 8,634	D 3
Rayville, 4.052	°B 4
Reddell, 500	D 3
Reeves, 151	D 2
Reggio, 180	C 8
Reserve, 5,297	B 6
Ringgold, 953	B 2
Roanoke, 600	D 3
Robeline, 308	C 2
Robert, 150	A 7, D 5
Rochelle, 175	C 3
Rocky Branch, 100	B 3
Rodessa, 700	B 2
Romeville, 150	B 6
Rosa, 80	D 3
Rosedale, 674	D 4
Roseland, 1,254	D 5
Rosepine, 414	D 2
Rougon, 375	D 4
Roy, 250	B 2
Ruby, 25	C 3
Ruston, 13,991	°B 3
St. Amant, 100	B 6
St. Benedict, 250	D 5
St. Bernard, 350	C 8, E 6
St. Francisville, 1,661	°D 4
St. Gabriel, 75	B 5
St. Gertrude,* 75	D 5
St. James, 280	B 6
St. Joseph, 1,653	°C 4
St. Landry, 425	D 3
St. Martinville, 6,468	°D 4
St. Rose, 1,099	C 7
St. Tammany, 50	B 8, D 6
Saline, 329	B 3
Samtown,* 4,008	C 3
Sarepta, 737	B 2
Schriever, 650	C 6, E 5
Scotlandville, 10,000	A 5
Scott, 902	D 3
Seymourville, 1,788	B 5
Shelburn, 75	B 4
Shell Beach, 125	E 6
Shongaloo, 200	B 2
Shreveport, 164,372	°B 2
Sibley, 595	B 2
Sicard,* 2,000	B 3
Sicily Island, 761	C 4
Sieper, 150	C 3
Sikes, 233	B 3
Simmesport, 2,125	D 4
Simpson, 400	C 2
Simsboro, 363	B 3
Singer, 150	D 2
Slagle, 100	C 2
Slaughter, 403	D 4
Slidell, 6,356	B 8, D 6
Smoke Bend, 450	B 5
Sondheimer, 350	B 4
Sorrento, 1,151	B 6, D 5
South Mansfield, 616	B 2
Southdown, 130	C 6
Spearsville, 90	B 3
Spokane, 200	C 4
Springfield, 350	B 6, D 5
Springhill, 6,437	A 2
Springville, 60	B 6, D 5
Standard, 150	C 3
Stanley, 234	C 2
Starks, 500	D 2
Sterlington, 1,200	B 3
Stonewall, 100	B 2
Sugartown, 125	D 2
Sulphur, 11,429	D 2
Sulphur South,* 1,351	D 2
Summerfield, 200	B 3
Summerville, 75	C 3
Sun, 1,125	D 6
Sunny Hill	D 5
Sunset, 1,307	D 3
Sunshine, 500	B 5
Supreme, 250	C 5
Swampers, 20	B 4
Swartz, 300	B 4
Taft, 260	B 6
Tallulah, 9,413	°B 4
Tangipahoa, 465	D 5
Tendal, 75	B 4
Terrytown,* 5,000	E 5
Theriot, 100	E 5
Thibodaux, 13,403	°C 6, E 5
Tickfaw, 317	D 5
Tioga, 250	C 3
Toro, 35	C 2
Transylvania, 50	B 4
Triumph, 900	E 6
Trout, 500	C 3
Tullos, 594	C 3
Tunica, 150	D 4
Turkey Creek, 279	D 3
Union, 640	B 5, D 5
Urania, 1,063	C 3
Vacherie, 950	C 6
Varnado, 331	D 6
Venice, 500	E 6
Verda, 57	C 3
Vernon, 35	B 3
Vick, 100	C 3
Vidalia, 4,313	°C 4
Vidrine, 80	D 3
Vienna, 250	B 3
Ville Platte, 7,512	°D 3
Vincent, 75	D 2
Vinton, 2,987	D 2
Violet, 900	C 8
Vivian, 2,624	B 2
Vowells Mill	C 2
Wadesboro, 150	B 6
Waggaman, 800	C 7
Walker, 912	A 6
Wallace, 130	B 6
Warden, 100	B 4
Wardville,* 1,086	C 3
Warnerton, 35	D 5
Washington, 1,291	D 3
Water Proof (Waterproof), 1,412	C 4
Waverly, 75	B 4
Weeks (Weeks Island), 1,138	E 4
Welsh, 3,332	D 3
West Monroe, 15,215	B 3
Westdale, 50	B 2
Westlake, 3,311	D 2
Westwego, 9.815	C 7, E 5
Weyanoke, 50	D 4
White Castle, 2,253	B 5, D 4
Whitehall, 150	B 6, D 5
Wilda, 20	C 3
Wildsville, 150	C 4
Willow Glen, 500	C 3
Wilson, 300	D 4
Winnfield, 7,022	°C 3
Winnsboro, 4,437	°B 4
Wisner, 1,254	C 4
Woodworth, 320	C 3
Youngsville, 946	D 3
Zachary, 3,268	D 4
Zenoria, 100	C 3
Zimmerman, 500	C 3
Zona, 50	D 5
Zwolle, 1,326	C 2
Zylks, 200	A 1

°County Seat.
*Does not appear on the map; key shows general location.

*Population of metropolitan area, including suburbs.
Source: Latest available census figures.

535 feet in Bienville Parish, is the highest point in Louisiana. But the most impressive hills are in southern Natchitoches Parish and northern Vernon Parish.

Coast Line. Louisiana has 397 miles of coast line along the Gulf of Mexico. Only Alaska, Florida, and California have longer general coast lines. Most of the Louisiana coast is so ragged and irregular that a measurement including bays and inlets totals 7,721 miles. The western part of the coast has only a few inlets, but many large bays cut into the eastern stretch. The chief bays include Atchafalaya, Barataria, Caillou, Cote Blanche, Terrebonne, Timbalier, and Vermilion.

Many islands lie off Louisiana's marshy coast. The chief ones include Breton, Chandeleur, Grand Isle, Isle Dernière, Marsh, and Timbalier.

Rivers, Bayous, and Lakes. Most of Louisiana was once part of an ancient bay of the Gulf of Mexico. The Mississippi and other rivers flowing down from the north deposited vast amounts of silt in the bay, until the entire area became land. Many of Louisiana's rivers today still carry great amounts of silt, especially during the flood season. The silt has raised the level of many river beds, and some rivers are higher than the surrounding backlands.

About a third of Louisiana would be covered with water every time the Mississippi flooded if it were not for *levees*. Since colonial times, these man-made walls have been built along the river to control the flood waters (see LEVEE). Levees stand along 1,600 miles of Louisiana's rivers. The Bonnet Carré Spillway, and floodways built in the Atchafalaya Basin, carry off high water when it pours over the levees.

Louisianians use the words *bayou* and *river* to mean the same thing. But a bayou is really a slow-moving inlet or outlet of a lake, bay, or river delta. The Atchafalaya River is actually a bayou, because it provides an outlet for the Mississippi River during the flood season. Bayous form the chief drainage system of lowland Louisiana, carrying off the overflow of rivers and swamps.

All rivers in Louisiana eventually flow into the Gulf of Mexico. The great Mississippi, its tributaries, and bayous reach into every part of the state. The chief tributary of the Mississippi in Louisiana is the Red River, which flows south from Arkansas. It enters Louisiana just north of Shreveport, and joins the Mississippi near Simmesport.

The Ouachita-Black River system winds across northeastern Louisiana, joining the Red River about 30 miles from Simmesport. The Calcasieu, Mermentau, Vermilion, and Sabine rivers form a network of waterways in southwestern Louisiana. Bayou Teche, the Atchafalaya River, and Bayou Lafourche lie farther east. The Pearl River forms part of Louisiana's boundary with Mississippi.

Louisiana has over 3,400 square miles of lakes. Lake Pontchartrain, a salt-water lake covering 610 square miles, is the largest. Other large coastal brackish, or salt-water, lakes include Barre, Borgne, Caillou, Calcasieu, Grand (in Cameron Parish), Little Maurepas, and White lakes. These lakes are extensions of the ocean cut off by ridges of sand or deposits of silt. Fresh-water lakes include Bistineau, Caddo, Catahoula, and Wallace. Many half-moon shaped *oxbow lakes* lie along the west side of the Mississippi River north of Baton Rouge (see OXBOW LAKE).

Natural Resources. The fertile soil of Louisiana produces fine harvests of food crops. Vast mineral deposits and timberlands supply many industries throughout the South. Wildlife in the fields, marshes, and the sea provide a living for trappers and fishermen.

Soil is Louisiana's greatest natural resource. Rich alluvial soil covers about a third of the state. Few regions of the world have so great a concentration of fertile farm lands. The Red River deposits reddish-brown soil along its banks, and silt from the Mississippi River forms a rich dark-colored soil. Peat and muck soils are found in the coastal marshes. The prairies in the southwest have clay and clay loams.

Minerals. Rich petroleum fields lie under nearly all Louisiana's 64 parishes. These oil fields extend into the Gulf of Mexico. The best-developed fields are in the southern marshlands and in Caddo Parish. Louisiana ranks second among the states in known petroleum reserves. Fields of natural gas have been developed in the northern section. Plaquemines and other coastal parishes have large sulfur deposits, and limestone is found in Winn and Bienville parishes.

Plant Life. More than 150 kinds of trees grow in Louisiana. Forests cover about half of the state. Great stands of oak, hickory, and shortleaf pine flourish on the hills in the northwest. Longleaf pine grows in the central section. A hardwood and bald-cypress region spreads along the Mississippi, Pearl, Red, and Sabine rivers. The U.S. Forest Service maintains the nation's largest forest-experimentation station at New Orleans.

Spanish moss, or "Spanish beard," clings to oak and cypress trees throughout the state. In spring, magnolia trees blossom along many southern stream banks. The roots of towering bald-cypress trees grow knobs called "knees." These knobs reach above the water to get air for the roots during high-water season in spring. Gardens, courtyards, and countryside bloom with azaleas, camellias, clematis, crape myrtle, honeysuckle, iris, jasmine, lilies, orchids, passionflowers, and spirea.

Animal Life. Rabbits thrive in all parts of Louisiana. The heavily wooded hills in the northwest have large numbers of gray foxes and beavers. White-tailed deer and wildcats roam the wooded swamps along the Mississippi and Atchafalaya rivers and in the Tensas River Basin. Minks, muskrats, opossums, raccoons, skunks, and wild hogs live in many of the wooded lowlands. Alligators make their homes in the coastal bayous.

More than 30 kinds of birds live in Louisiana throughout the year. Almost half the wild ducks and geese in North America spend the winter in the marshes along the coast. Wild turkeys feed along some rivers and in swamps and uplands. Bald eagles, egrets, gulls, herons, and pelicans nest in the salt marshes along the Gulf Coast. The state has set aside 50,000 acres, chiefly in the coastal marshes, as refuges for the thousands of waterfowl that winter in Louisiana.

Many kinds of fish live in Louisiana's waters. Salt-water fishermen seek giant rays, jackfish, king mackerel, sharks, and tarpons in the Gulf. Fresh-water fish include bass, catfish, gaspergou, pike, and sunfish.

Climate. Most of Louisiana has a semitropical climate. Temperatures vary, depending on the distance from the Gulf of Mexico. July temperatures average slightly below 82°F. in the south, and a little above this figure in the north. Plain Dealing had the state's record high of 114°F. in August, 1936. January temperatures average 55°F. in the south, and 48°F. in the north. The temperature at Minden fell to a record −16°F. in February, 1899.

Louisiana has an unusually long growing season. In the south, the season lasts about 330 days, from early February to mid-December. The north has about 220 days, from late March to early November.

The state has an average yearly rainfall of about 55 inches. Sometimes more than 85 inches of rain falls in the southeast. Occasional hurricanes strike the coast.

Life of the People

The People. Louisiana had a population of 3,257,022 in 1960, or about 67 persons to the square mile. This was an increase of 21 per cent over the 1950 population of 2,683,516. About 63 of every 100 persons live in cities or towns.

Colonists from France and Spain established the first settlements in Louisiana. The descendants of these early white settlers are called *Creoles* (see CREOLE). Groups of Acadians settled in Louisiana after the late 1700's, after they were driven from their homes in Acadia, or Nova Scotia. Acadians are sometimes called *Cajuns* (see ACADIA). About a third of Louisiana's people are Negroes.

Many persons in southern Louisiana speak French as well as English. Until 1887, state laws and official notices appeared in both languages. Some French-speaking Negroes use a French *patois*, or dialect, called "Gumbo" or "Gombo."

Southern Louisiana has a reputation for fine food. Favorite soups include *bisque*, a thick soup made with shellfish; *gumbo*, a soup thickened with okra; and a kind of fish soup called *bouillabaisse*. Fish specialties include *huitres en coquille a la Rockefeller* (oysters baked on rock salt with a special spinach sauce) and *pompano en papillote* (pompano fish baked in a paper bag with a shellfish sauce). The people sometimes add chicory when preparing their strong black coffee. *Pralines*, made of pecans and brown sugar, are famous candies.

Most of the early Louisiana settlers were Roman Catholics who came from France. In 1724, Jean Baptiste le Moyne, Sieur de Bienville, adopted the Black Code, which regulated Negro slave life and also banned all religions except Roman Catholicism. But the United States restored freedom of worship in the territory after the Louisiana Purchase in 1803. Today, about a third of the people belong to the Roman Catholic Church. Other large religious groups include the Baptists, Methodists, Episcopalians, and Presbyterians.

Cities. More than half the people live in towns and cities, but only 12 of the cities have populations of over 20,000. Most of Louisiana's larger cities grew up on navigable rivers. New Orleans is sometimes called the "Paris of America," because of the gaiety and charm of its French Quarter. Large manufacturing plants and oil refineries line the banks of the Mississippi River in Baton Rouge. Shreveport is the industrial center of northwestern Louisiana. See the separate articles on Louisiana cities listed in the *Related Articles* at the end of this article.

Country Life. Before the 1900's, social life among farm families centered around the farm or plantation, the church, or the small country school. But the coming of automobiles and surfaced roads permitted farm people to travel to town quickly, and to take part in all kinds of activities.

Small farming towns dot the state. A few towns in southern Louisiana, established by the French, resemble European towns, with high walls around the houses, and narrow, winding streets. They include Abbeville, St. Martinville, and Thibodaux.

Work of the People

More Louisianans earn their living in agriculture than in any other activity. But a great industrial boom began in the 1940's. Industries moving from northern states helped develop and use Louisiana's resources. As a result, more and more persons are leaving agriculture to fill new jobs in industry. Of every 100 workers, about 24 are employed in agriculture, 17 in wholesale and retail sales, and 16 in manufacturing.

Agriculture. Louisiana has more than 124,000 farms, ranches, and plantations, covering over 11,500,000 acres. The farms average a little more than 100 acres in size. Owners operate more than half of them. Large plantations rely on hired workers, sharecroppers, and tenant farmers to plant and harvest the crops.

Cotton ranks as Louisiana's chief cash crop. Annual production totals about 452,000 bales, putting Louisiana among the 10 leading cotton states. The main cotton-producing parishes include Caddo, Franklin, Morehouse, Richland, and St. Landry.

Rice production totals about 1,210,000,000 pounds a year. Only Texas grows a larger rice crop. Louisiana's largest rice-producing areas are the flat irrigated fields of Acadia, Calcasieu, Evangeline, Jefferson Davis, and Vermilion parishes.

Sugar Cane. About 95 per cent of all the sugar cane grown in the continental United States comes from Louisiana. Only Hawaii produces more sugar cane than Louisiana. Louisiana grows over 5,540,000 tons of cane annually, producing about 605,000 tons of sugar. Leading sugar-producing parishes in Louisiana include Assumption, Iberia, Lafourche, St. Mary, and Terrebonne.

Potatoes. Louisiana leads the nation in sweet-potato production. Farmers annually harvest about 496,000,000 pounds of *Louisiana yams*, as sweet potatoes are called locally. Many ranchers feed their cattle dried sweet potatoes. St. Landry Parish produces the largest crops, followed by Acadia, Evangeline, and Lafayette parishes.

The farmers of nearly every parish grow Irish potatoes, partly because they grow so quickly. Irish potatoes can be harvested within 100 days, and farmers can then plant other crops in the same fields.

Other Crops. Louisiana farmers plant corn to provide livestock feed, but sell some for the manufacture of cornmeal and cereals. Truck farms in the southern area produce beans, cauliflower, lettuce, and other vegetables (see TRUCK FARMING). Markets in northern and eastern states depend on Louisiana for many winter and spring vegetables. Farmers often plant crops of alfalfa, lespedeza, soybeans, and velvet beans to use as cattle feed.

A kind of tobacco called *perique* is produced nowhere in the world except in St. James Parish. Tobacco manufacturers buy the dark, strong perique leaves for flavoring and blending with other tobaccos.

Louisiana produces more tung nuts than any other state except Mississippi. Annual production totals over 18,000 tons. The state also harvests crops of peanuts and pecans. Figs, grapefruits, and oranges come from southeast Louisiana. Over 4,000 farms in the Florida parishes grow strawberries. Hammond is known as the "Spring Strawberry Capital of America." Farmers in the north grow nectarines, pears, and peaches.

Livestock, Dairying, and Poultry. About two thirds of the farmers raise beef cattle, hogs, and sheep. Most large-scale cattle ranches operate on the open ranges in the southwest and along the Red and Ouachita rivers. Dairy farms cluster around the larger cities. Louisiana ranks among the 10 leading mule states. About 90 of every 100 farmers raise poultry.

Manufacturing and Processing. Louisiana has more than 3,800 manufacturing and processing plants. The alumina plant at Baton Rouge extracts alumina from bauxite shipped from Jamaica and Surinam. A plant at Chalmette makes aluminum from the alumina. Chemical plants manufacture more than 700 products, including rubber and rayon. Huge petroleum refineries operate at Shreveport, Baton Rouge, and Lake Charles. Natural-gas fields near Monroe provide the raw materials for carbon black. Only Texas produces more carbon black than Louisiana.

Many sugar refineries operate near New Orleans. About 35 rice mills clean and polish rice in the southwest. Crowley is called the "Rice City of America," because of its importance as a rice-milling center. Cotton gins operate in nearly every city of the cotton belt. About 20 factories in this area press cottonseed oil and cake from the seeds separated by the gins.

Mining. Louisiana has about 860 petroleum and natural-gas fields. The petroleum industry operates about 27,000 wells, mostly in the southern marshlands. Some wells have been sunk from platforms standing on piles in the Gulf of Mexico. Petroleum production in the north centers around Shreveport. Annual crude oil production averages 245,000,000 barrels. Only Texas and California produce more crude oil.

Most of the natural-gas fields are in northern Louisiana. They produce about 58,000,000,000 cubic yards annually. Louisiana is one of the leading salt-producing states. Salt mines lie under islands in the coastal marshes, and some mine shafts reach out below the sea. Much of the salt is 99 per cent pure. Annual production totals over 3,300,000 tons. Great sulfur wells in Plaquemines Parish produce about 2,240,000 tons a year.

Forest Products. Forests in Louisiana include more than 16,000,000 acres of commercial timber. Sawmills cut about 750,000,000 board feet of lumber a year. Stands of loblolly and shortleaf pine in the northwest produce wood for building construction and for wood pulp. Furniture manufacturers buy hardwoods cut along the Red and Mississippi rivers. From November to April, pickers gather Spanish moss, an herb that hangs from trees. Cured Spanish moss makes an excellent packing material, and is also used to stuff mattresses.

Fishing and Fur Industries. Commercial fish production in Louisiana ranks among the highest in the United States. Fishermen catch over $20,000,000 worth of fish and shrimp annually. Louisiana is second to Texas in shrimp production, with about 52,000,000 pounds a year. The state harvests about 9,500,000 pounds of oysters every year. Oyster-packing industries center in Houma, which is sometimes called the "Oyster City of the South."

Louisiana leads in the production of muskrat fur. Trappers sell more than 1,330,000 muskrat pelts a year. In 1930, breeders brought a few coypu into Louisiana from Argentina (see COYPU). Today, nearly 400,000 of their pelts, called *nutria*, go to fur markets every year.

Electric Power. Widespread electrification began just before World War II. Most of the commercial electric plants use steam generators powered by natural gas or petroleum. For Louisiana's kilowatt-hour production, see ELECTRIC POWER (table).

Transportation. Early settlers in Louisiana traveled in boats called *pirogues*, made from hollowed-out cypress logs. Steamboats began moving on the rivers after 1812, making it possible to carry goods upstream as well as downstream. The Mississippi River became the great highway of trade and commerce for the interior of the United States. But the rivers became a major obstacle to the construction of highways and railroads. To solve this problem, the state built a network of bridges. But ferries moved trains and automobiles across the Mississippi River until the 1930's. The Huey P. Long Bridge, opened in 1935, was the first major effort in Louisiana to span the Mississippi. It speeds automobiles and trains across the river near New Orleans.

Aviation. Airlines serve all the important cities in Louisiana, with flights into New Orleans, Baton Rouge, Shreveport, and other large cities. Flights leave daily for all parts of the United States and many important cities in Central and South America. The state has about 82 airports.

Railroads. The Pontchartrain Railroad began operating in 1831 between New Orleans and Lake Pontchartrain. It was the first railroad west of the Allegheny Mountains. Today, more than 30 railroads run through the state on about 4,000 miles of track.

Roads and Highways. Louisiana has over 47,000 miles of roads, highways, and city streets. About three fourths of them are surfaced, and most of the rest are gravel. The state completed the world's longest bridge, the Lake Pontchartrain Causeway, in 1956. It spans 24 miles of water, connecting New Orleans with St. Tammany Parish on the north.

Shipping. Most port activities center in New Orleans, Baton Rouge, and Lake Charles. Approximately 5,000 ships a year dock at New Orleans. The city ranks as one of the largest ports in the world, based on total tonnage handled. Baton Rouge lies on the Mississippi River, 235 miles from the Gulf of Mexico. Vessels drawing up to 35 feet of water can dock at Baton Rouge. Lake Charles is nearer the Gulf of Mexico than any other major port in Louisiana. Ships have to travel only 35 miles up the Calcasieu River to reach this port.

Waterways. Louisiana has nearly 5,400 miles of waterways. The Gulf Intracoastal Waterway crosses the coastal marshes. It provides the only sheltered route for barges and small craft traveling east and west between the Mississippi and Sabine rivers.

Communication. The first newspaper in Louisiana was established at New Orleans in 1794 by Louis Duclot. This French-language journal, *Le Moniteur de la Louisiane (The Louisiana Monitor)*, was the only paper in the region until the Louisiana Purchase in 1803. The next year, the first English-language newspaper in Louisiana, *The Louisiana Gazette*, began publication in New Orleans.

Louisiana has over 20 daily and 70 weekly newspapers. The *New Orleans Times-Picayune* and *New Orleans States-Item* lead in circulation. Other important papers include the *Baton Rouge State Times* and the *Shreveport Times*.

Louisiana's first radio station, WWL, started operations in New Orleans in 1922. The first TV station, WDSU-TV in New Orleans, started in 1948.

Education

Schools. Capuchin monks founded Louisiana's first school in New Orleans in 1725. In 1727, the Ursuline nuns started a school for women and girls that still operates in New Orleans. Various colonial governors tried to set up a system of public education. But the colonists refused to support what they called "pauper" schools. Wealthy planters and merchants usually sent their sons to European schools. Most girls attended the Ursuline nuns' school.

Louisiana's first public schools opened in New Orleans in 1811. But real progress began only after 1898, when the state constitution authorized parish school districts to issue bonds to pay for education.

Louisiana spends about a third of its income to operate the public schools. The people elect the state superintendent of education to a four-year term. The schools are organized into 67 local school systems, divided among the 64 parishes and three of the cities, Bogalusa, Lake Charles, and Monroe. Each parish or city elects a local board of education, usually for terms of four years. The local boards appoint their own parish or city superintendent for four years. Children between the ages of 7 and 16 must attend school. For the number of students and teachers in Louisiana, see EDUCATION (table).

UNIVERSITIES AND COLLEGES

The following accredited institutions of higher learning in Louisiana have separate articles in WORLD BOOK. For enrollments, see UNIVERSITIES AND COLLEGES (table).

NAME	LOCATION	FOUNDED
Centenary College	Shreveport	1825
Dillard University	New Orleans	1925
Grambling College	Grambling	1901
Louisiana College	Pineville	1906
Louisiana Polytechnic Institute	Ruston	1894
Louisiana State University and Agricultural and Mechanical College	Baton Rouge	1845
Loyola University	New Orleans	1904
McNeese State College	Lake Charles	1939
Northeast Louisiana State College	Monroe	1931
Northwestern State College of Louisiana	Natchitoches	1884
Notre Dame Seminary	New Orleans	1923
St. Mary's Dominican College	New Orleans	1910
Southeastern Louisiana College	Hammond	1925
Southern University and Agricultural and Mechanical College	Baton Rouge	1880
Southwestern Louisiana, University of	Lafayette	1898
Tulane University of Louisiana	New Orleans	1834
Xavier University	New Orleans	1925

Louisiana has 17 accredited four-year colleges and universities, 3 nonaccredited colleges, and 1 junior college. The state board of education supervises and controls the state colleges and Southern University.

Libraries. The first public library in Louisiana was established in 1805 in New Orleans. That same year, the territorial legislature authorized a subscription library called the New Orleans Library Society to begin operations. The New Orleans Public Library, founded in 1843, has the largest collection in the state. The Louisiana State Library, created in 1925, provides bookmobiles for rural areas. It also helps parishes establish their own libraries.

Museums. The Louisiana State Museum in New Orleans owns the state's largest collections of historical documents, portraits, and furniture. Mayan relics are displayed in the museum of the Middle American Research Institute at Tulane University. The state's largest art collection is in the Isaac Delgado Museum of Art in New Orleans. The State Exhibits Building at Shreveport displays paintings by Louisiana artists.

The Arts

Painting. Many early paintings in Louisiana were created by artists from other countries. John Wesley Jarvis, a nephew of the English churchman John Wesley, set up a studio in New Orleans during the early 1800's. He painted portraits of wealthy Louisianians and their families. In 1821, John James Audubon started painting portraits in New Orleans. After four months, he moved to West Feliciana Parish, where he sketched many birds of the region. During the 1830's, George Catlin visited Louisiana to paint Indians.

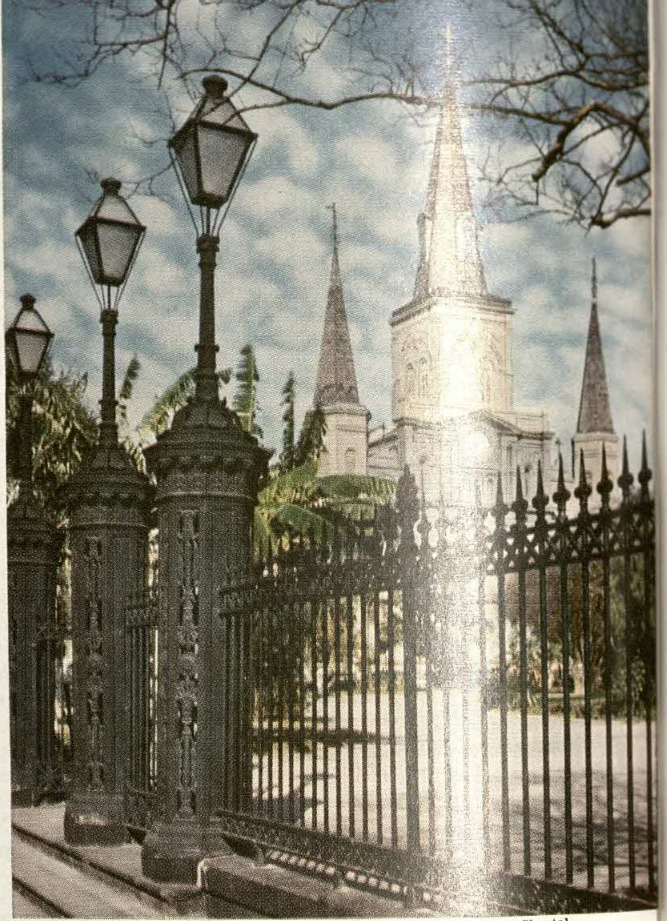
Edgar Degas passed through the city in 1873, and painted *Cotton Market in New Orleans*. The etcher Joseph Pennell worked in New Orleans in 1883, and completed a series of sketches to illustrate George Cable's book, *Creoles of Louisiana*. During the early 1900's, Alexander Drysdale painted many landscapes of the swamp and bayou country.

Literature. Many French explorers of the 1700's kept diaries that described the Indians, plants, and animals of Louisiana. Historians still study works by Father Pierre F. X. Charlevoix, Dumont de Montigny, and Henri de Tonti to learn about life during the settlement of Louisiana. Antoine G. Le Page du Pratz wrote the first general history of the region in 1758.

As late as 1850, most authors in Louisiana wrote in French. After the Civil War, literary works appeared in English. George W. Cable and Grace King wrote popular stories about the Creoles. Louisiana-born writers of the 1900's include Hamilton Basso, Roark Bradford, Truman Capote, Harnett T. Kane, Fannie Heaslip Lea, Harold Newman, Lyle Saxon, and Robert Tallant.

Music. The music-loving Creoles welcomed every op-

Street Bands play in the French Quarter of New Orleans. The city is called "the cradle of jazz."

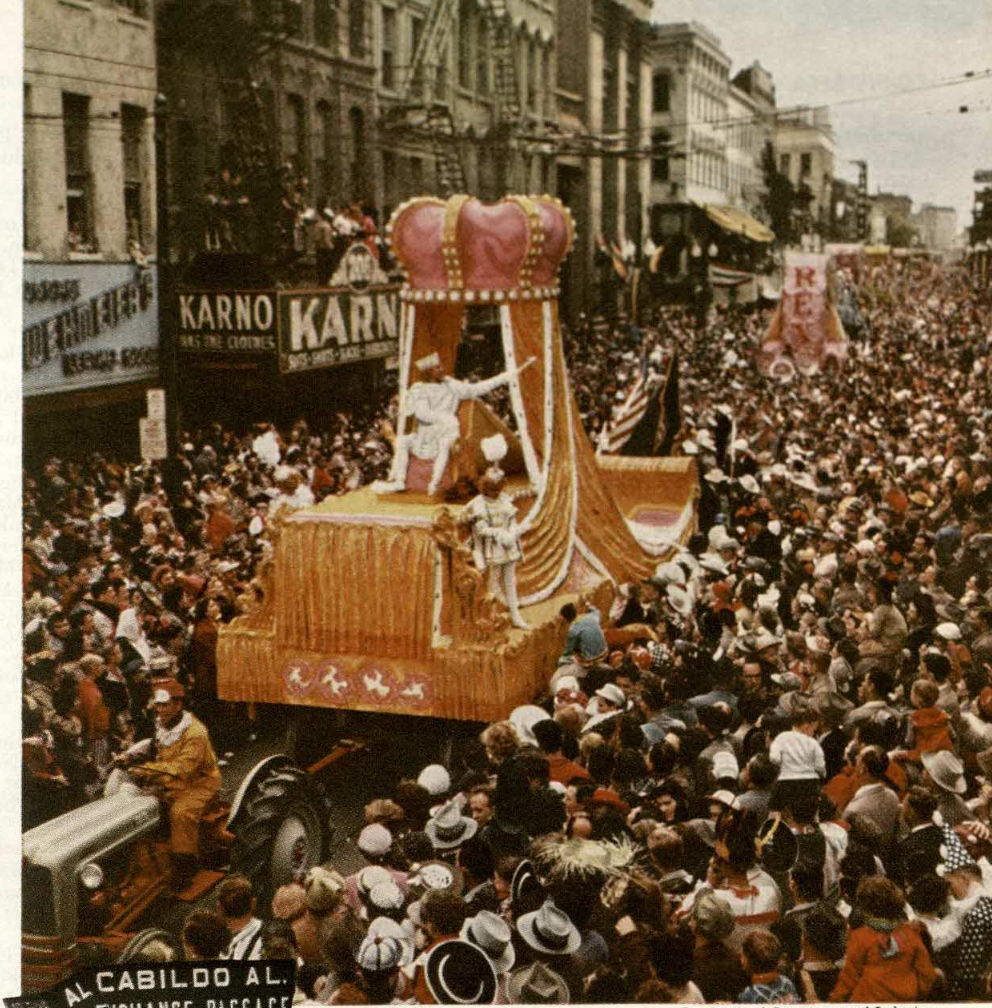


St. Louis Cathedral, in the French Quarter, was built when Spain ruled New Orleans. It was the gift of a Spanish nobleman.

Shostal

Fishing and Hunting in Louisiana attract sportsmen from all parts of the nation. Black bass lurk in Lake Bistineau near Shreveport. Spanish moss drapes the cypress trees. Deer feed in the wooded swamps, and game birds nest in the marshes.

La. Dept. of Commerce and Industry



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Mardi Gras Parades wind through New Orleans for five days and nights before the start of the religious season of Lent. Rex, Lord of Misrule, appears on Mardi Gras morning. The yearly festival began in Colonial days.

The State Capitol rises 34 stories at Baton Rouge. It was built in 1932, when Huey P. Long was governor of Louisiana.

Candy Vendors sell pecan pralines on New Orleans streets. A favorite sales spot is Pirates Alley in the French Quarter.

La. Dept. of Commerce and Industry

Camera Clix

portunity to hear recitals and concerts. By 1850, New Orleans had become one of the great music centers of the United States. The French Opera House in the *Vieux Carré*, or Old Square, of New Orleans presented the American premieres of several operas.

A wealth of folk music has come from Louisiana. Irene Therese Whitfield collected songs of the Acadians in *Louisiana French Folk Songs*. Negroes sang many of their songs in the French dialect called "Gumbo." Clara G. Peterson published these tunes in *Creole Songs*. Mina Monroe and Kurt Schindler also collected Gumbo songs in *Bayou Ballads*.

New Orleans is considered the cradle of jazz. Nick LaRocca, Louis Armstrong, Jelly Roll Morton, and many other New Orleans musicians and composers became famous jazz performers (see JAZZ).

Interesting Places to Visit

More than 4,000,000 tourists visit Louisiana every year. Thousands of tourists visit the old French sections of New Orleans and the stately plantations of old Louisiana families. Hunters come to shoot ducks and geese in the swamps. Other sportsmen catch fresh-water fish in the lakes, or charter boats to take them along the Gulf Coast in search of salt-water game fish. Deep-sea fishermen from all parts of the country come to the Grand Isle Tarpon Rodeo each year to test their skills against other anglers.

Following are brief descriptions of some of Louisiana's most interesting places to visit.

Avery Island rises amid sea marshes and swampy thickets near New Iberia. This tree-covered island covers a huge salt dome. Plants from all parts of the world grow in the island's jungle gardens.

Delta Country lies along the Mississippi River in Plaquemines Parish. The huts of trappers and the villages of fishermen stand in the salty marshes.

Evangeline Country, in the south-central part of the state, became famous because of Longfellow's poem *Evangeline* (see EVANGELINE). The Evangeline Oak, in St. Martinville, marks the legendary spot where some of the Acadians landed after fleeing from Nova Scotia. According to tradition, Emmeline Labiche and Louis Arceneaux, the Evangeline and Gabriel of Longfellow's poem, met under this tree.

Feliciana Country includes the parishes of East and West Feliciana. John J. Audubon made many bird sketches among the wooded hills of the region. Old plantation homes stand on wooded hillsides.

Grand Isle lies south of New Orleans at the entrance to Barataria Bay. A few descendants of the pirate crew of Jean Laffite live in the village on this island (see LAFFITE, JEAN).

National Parks and Forests. Chalmette National Historical Park marks part of the area of the Battle of New Orleans. The park grounds, together with a nearby military cemetery area, cover about 135 acres. A marble monument about 100 feet high towers above the spot where General Andrew Jackson directed the battle. The federal government established the site as the Chalmette Monument and Grounds in 1907, and as an historical park in 1939.

Kisatchie National Forest covers 591,566 acres between the Calcasieu, Red, and Sabine rivers. The forest serves primarily as a conservation area, but has facilities for camping, fishing, swimming, and boating. It was established in 1930.

State Parks. Louisiana's 15 state parks cover about 11,500 acres. The following list includes the more important areas.

Audubon Memorial (100 acres), just outside St. Francisville, occupies the Oakley plantation, where Audubon made sketches for *Birds of America*. The house includes an Audubon museum. Established in 1947.

Chemin-à-Haut (500 acres), in a pine-forested area near Bastrop, has bayous that offer excellent fishing. The park includes a group camp, lodge, and cabins. Established in 1936.

Chicot (6,000 acres), near Ville Platte, is Louisiana's largest state park. The lakes nestled among its rolling hills provide excellent boating, swimming, and fishing. The park also has two group camps, individual campsites, and a swimming pool. Established in 1943.

Fontainebleau (2,450 acres), near Mandeville on Lake Pontchartrain, offers water sports, hiking, and picnicking. It occupies the site of the summer plantation home built in the 1800's by Bernard de Marigny, Sieur de Mandeville, who founded the city of Mandeville. Established in 1943.

Longfellow-Evangeline Memorial (157 acres) stands near St. Martinville, in the Cajun country. The park has an Acadian Craft Shop maintained by Louisiana State University, and a lodge and a group camp. Established in 1935.

Louisiana Purchase Memorial (141 acres) includes the remains of two old forts built near New Orleans. Fort Pike, completed in 1818, has a moat and dungeonlike passages. Fort McComb was built between 1820 and 1828. Established in 1935.

Marksville Prehistoric Indian (40 acres), near Marksville, includes a prehistoric Indian village and six Indian mounds. The natural-history museum has replicas of relics dug up under the direction of the Smithsonian Institution. Established in 1936.

Sam Houston (1,040 acres), near Lake Charles, has wooded areas that provide fine sites for camping and picnicking. The Calcasieu River and Indian Bayou offer boating and fishing. Established in 1953.

Annual Events in Louisiana

Visitors from all parts of the country come to New Orleans for the carnival season and the Mardi Gras. The season begins on Twelfth Night, January 6, and is celebrated with many dances and balls throughout the month. Parades that include colorful floats and thousands of people in gay costume begin on the Wednesday night before Shrove Tuesday. The parades continue every night except Sunday until the Mardi Gras itself, on Shrove Tuesday evening. See MARDI GRAS.

Other annual events in Louisiana include the following.

January, Sugar Bowl football game at New Orleans, New Year's Day; Carnival Season at New Orleans, Jan. 6 to the night of Shrove Tuesday, in February or March; Jackson Day, state-wide, commemorating the Battle of New Orleans, Jan. 8; Robert E. Lee's birthday, state-wide, Jan. 19.

February or *March*, Mardi Gras Week at New Orleans, beginning the Wednesday before Shrove Tuesday, and ending the night of Shrove Tuesday.

March, Azalea Tour at Lafayette, no fixed date; Strawberry Festival at Hammond, no fixed date; Audubon Pilgrimage in East Feliciana Parish, in March or April.

May, Pirogue racing in southern towns, no fixed dates.

June, Confederate Memorial Day, state-wide, June 3.

August, Louisiana Boat Festival-Pan American Regatta at New Orleans, no fixed date; Blessing of the Shrimp

Fleet at Morgan City, Golden Meadow, and Houma, no fixed dates; Tarpon Rodeo at Grand Isle, no fixed date; Huey P. Long's birthday, state-wide, Aug. 30.

September, Tarpon Rodeo at Lake Charles, no fixed date.

October, International Rice Festival at Crowley, no fixed date; Sugar Cane Festival at New Iberia, no fixed date; State Fair at Shreveport, last week in October.

November, All Saints' Day, state-wide, Nov. 1.

December, Mid-Winter Sports Carnival at New Orleans, last week in December.

Government

Constitution. Louisiana has had 10 different constitutions. The present constitution, adopted in 1921, included so many details that it has been amended more than 300 times in an effort to satisfy the people everywhere in the state. No other state constitution has been changed so many times. An amendment must originate in the senate or house of representatives, and must receive a two-thirds majority vote in each house. A majority of the voters in the state must then approve the amendment for it to become law.

Executive. The governor serves a four-year term. He cannot succeed himself, but may serve more than one term. Other elected officials include the lieutenant governor, secretary of state, attorney general, auditor, treasurer, and superintendent of education. All serve four-year terms, and all may succeed themselves.

The state government includes more than 150 agencies, commissions, and departments. The governor appoints the heads of most of these to four-year terms.

Legislature. The Louisiana legislature meets every year on the second Monday in May. Regular sessions last for 60 days during even-numbered years. Sessions held during odd-numbered years consider only budgetary affairs, and are limited to 30 days.

The voters elect 39 senators from 34 senatorial districts for terms of four years. Five districts with especially large areas or populations elect two senators each. The 101 representatives are elected by the parishes, city wards in New Orleans, and districts apportioned on a population basis. They also serve four-year terms.

Courts. Louisiana is the only state with a legal system based on *civil law*, or laws passed by the state government. Other states rely on *common law*, or laws based on court decisions. Many Louisiana laws come from old French or Spanish laws and the Code Napoléon (see CODE NAPOLÉON).

The supreme court of Louisiana consists of a chief justice and six associate justices, elected for 14-year terms. Voters elect judges of the courts of appeal for terms of 12 years, and district-court judges to 6-year terms. There are also municipal, juvenile, and family courts, and justices of the peace.

Local Government. Louisiana has three units of local government: the parish (county), the city, and the special district. Count Alexander O'Reilly, a Spanish colonial governor in 1769, established the parishes as administrative divisions of the Roman Catholic Church. A police jury, which corresponds to the board of county commissioners in other states, governs most parishes. The voters elect members of the police jury to four-year terms. Most cities have a mayor-council government.

Taxation. Most of Louisiana's tax revenue comes from mineral leases and royalties. The state also taxes personal and corporation incomes. To encourage the development of industry, Louisiana exempts new manufacturing companies from property taxes for 10 years. It also waives property taxes for the same period on additions to existing industries.

Politics. Louisiana has voted Democratic in every national election since 1876, except in 1948 and 1956. Republicans have little influence in local politics. For Louisiana's voting record in national elections since 1812, see ELECTORAL COLLEGE (table).

National Defense. The 8th Coast Guard District has headquarters in New Orleans. The Louisiana National Guard maintains headquarters at Baton Rouge. U.S. Air Force bases include England Air Force Base, at Alexandria; Chennault Air Force Base, at Lake Charles; and Barksdale Air Force Base, near Shreveport. The U.S. Army has a base at Fort Polk, in Leesville.

History

Indian Days. About 13,000 Indians lived in Louisiana when Robert Cavelier, Sieur de la Salle, entered the region in 1682. They belonged to about 30 tribes in the eastern woodlands group, including the Attakapa, Caddo, Chitimachas, and Tunicas. These Indians usually lived in villages on the banks of rivers and bayous. They sometimes built huts of poles, thatched with palmetto leaves and plastered with mud. The women tended the fields, and the men hunted and fished. See INDIAN, AMERICAN (table, Indian Tribes).

Exploration and Early Settlement. In 1541, Hernando de Soto led a group of Spanish explorers into the area in a vain search for gold. The Spanish abandoned Louisiana after De Soto died in 1542.

In 1682, La Salle led 50 men down the Mississippi River to its mouth from the Great Lakes region. On Apr. 9, 1682, he claimed the entire Mississippi Valley for France. He symbolized the claim by erecting a cross, and a column bearing the French coat of arms, near the mouth of the river.

Pierre le Moyne, Sieur d'Iberville, established a royal Louisiana colony in 1699. He founded a French settlement of 200 persons at what is now Ocean Springs, Miss. This settlement served as the capital of Louisiana until 1702, when the capital was moved to Fort Louis de la Mobile, near present-day Mobile, Ala. Sauvole de Villantry and Jean Baptiste le Moyne, Sieur de Bienville, a younger brother of Iberville, served as acting governors under Iberville until his death in 1706.

In 1712, France gave exclusive trading rights in Louisiana to Antoine Crozat, a merchant. A trader named Louis Juchereau de St. Denis established Natchitoches in 1714 on the banks of the Red River. This became the first permanent town in Louisiana. In 1717, Crozat transferred his trading rights in Louisiana to John Law, a promoter in Paris. Law launched an unscrupulous plan to colonize Louisiana (see MISSISSIPPI SCHEME).

In 1718, Sieur de Bienville again became governor of the colony. He laid out New Orleans that same year, and it became the capital of Louisiana in 1722.

Law's scheme to colonize Louisiana finally failed in 1720. Louisiana again became a royal colony of France in 1731. But the French were disappointed with the small income produced by the colony. In 1762, France secretly ceded to Spain New Orleans and the area of Louisiana west of the Mississippi River. French colonists resented the transfer. In 1768, a band of rebels drove out the Spanish commandant. But Spain took firm control of its new possession in 1769.

From the 1760's to 1790, several thousand Acadians fled to Louisiana after British colonial troops drove them from their homes in Nova Scotia. The Acadians settled chiefly along Bayous Teche and Lafourche, the Cajun country of today.

During the American Revolutionary War, Spain let agents of the Continental Congress come to New Orleans. These agents shipped supplies up the Mississippi and Ohio rivers to the struggling Atlantic colonies.

Louisiana prospered under Spanish rule. The stable government encouraged business and commerce. Antonio Mendez began operating the first sugar refinery in what is now the United States at New Orleans in 1791. The sugar industry expanded rapidly after that time. In 1800, Napoleon forced Spain to return the colony to France by the secret Treaty of San Ildefonso.

Territorial Days. France sold Louisiana and the rest of the Mississippi Valley region to the United States in 1803 for $15,000,000 (see LOUISIANA PURCHASE). The United States took possession of the Louisiana Territory on December 20, and William C. C. Claiborne became the first governor of the territory.

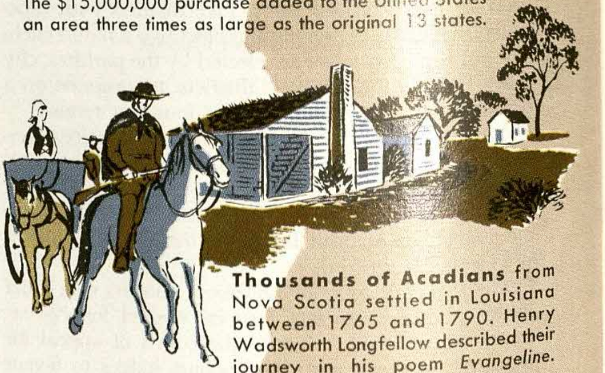
In 1804, Congress divided this huge new territory to make it easier to govern. One part became the Territory of Orleans, covering about the same area as the present state of Louisiana. The other part, beyond the present north boundary of the state and west of the Mississippi, became the Territory of Louisiana.

An era of commercial expansion began when the steamboat *New Orleans* made the first trip down the Ohio and Mississippi rivers from Pittsburgh, Pa., to New Orleans in the winter of 1811-12. The Mississippi soon became the chief shipping waterway of inland America.

Statehood. In 1810, settlers in the Spanish possession of West Florida revolted against Spain and organized the independent Republic of West Florida. The United States annexed part of the republic in October, 1810, as part of the Territory of Orleans. On Apr. 30, 1812, the Orleans Territory was renamed Louisiana, and became the 18th state of the Union. Claiborne served as the first governor of the state, which had a population of about 76,600 at that time.

The War of 1812 began soon after Louisiana became a state. In January, 1815, the British tried to capture New Orleans. Unknown to both sides, a treaty of peace had already been signed. General Andrew Jackson and his little army of pirates and frontiersmen defeated the

The Louisiana Purchase was signed in Paris on April 30, 1803, by James Monroe and Robert Livingston. The $15,000,000 purchase added to the United States an area three times as large as the original 13 states.



Thousands of Acadians from Nova Scotia settled in Louisiana between 1765 and 1790. Henry Wadsworth Longfellow described their journey in his poem *Evangeline*.

The Pirates of Jean Laffite terrorized the entire Louisiana coast in the early 1800's.

RED-LETTER DATES IN LOUISIANA

1682	La Salle reached the mouth of the Mississippi River, and claimed the river valley for France.
1699	France founded the colony of Louisiana.
1714	Louis St. Denis founded Natchitoches.
1718	Jean Baptiste le Moyne, Sieur de Bienville, founded New Orleans.
1762	France ceded Louisiana to Spain.
1768	French colonists rebelled against Spanish rule.
1791	Antonio Mendez set up the first sugar refinery in the present-day United States at New Orleans.
1800	Spain transferred Louisiana back to France.
1803	The United States completed the Louisiana Purchase.
1812	Louisiana entered the Union as the 18th state on April 30.
1815	Andrew Jackson defeated the British in the Battle of New Orleans.
1861	Louisiana seceded from the Union.
1862-1877	U.S. troops occupied Louisiana. The state was readmitted to the Union in 1868.
1879	James B. Eads finished jetties that deepened the mouth of the Mississippi River so that large ocean ships could reach New Orleans.
1916	The Monroe natural-gas field was opened.
1928	Huey P. Long became governor.
1933	Engineers completed the first sections of the Gulf Intracoastal Waterway.
1956	The world's longest overwater highway bridge, 23.8 miles, was completed over Lake Pontchartrain.
1957	The state began construction of the Mississippi-Gulf Canal, a 76-mile short cut to the sea from New Orleans.

British on January 8 in the Battle of New Orleans (see Jackson, Andrew [Glory at New Orleans]).

Thousands of new settlers arrived in Louisiana between 1815 and 1860. Trade expanded when Captain Henry M. Shreve opened the northern stretch of the Red River to navigation in the 1830's. He cleared a mass of snags, roots, and logs from the river. Alexandria, Natchitoches, and Shreveport became trade centers as traffic developed along the Red River. The state capital moved to Donaldsonville in 1830, but moved back to New Orleans the next year. The state legislature moved the capital to Baton Rouge in 1850, where it remained until 1862.

The Civil War and Reconstruction. On Jan. 26, 1861, Louisiana seceded from the Union and mobilized for war. The state joined the Confederacy on March 21. The Civil War did not touch Louisiana until 1862, when Admiral David C. Farragut's fleet occupied New Orleans. Union forces under General Benjamin F. Butler occupied the city on May 1, 1862, without a battle. Butler ruled New Orleans with such strict laws that the people called him "Beast Butler" (see Butler, Benjamin Franklin). The Union forces maintained a capital in New Orleans throughout the war. The Confederate state government established its capital at Opelousas in 1862. Union troops gradually extended their control, but there was little fighting. The Confederate state capital moved to Shreveport in 1863 to avoid capture. See Civil War.

At the end of the war, Louisiana was bankrupt. It had been the first Confederate state to be occupied, but one of the last readmitted to the Union. A series of military governors ruled the state from New Orleans until 1868. In that year, H. C. Warmoth took office as governor after winning an election in which Negroes cast most of the votes, because most whites were not allowed to vote. During his administration, carpetbaggers, scalawags, and bands of homeless Negroes stripped the state (see Carpetbagger). Government officials imposed crushing taxes on the people, officially disregarding the rights of whites. The people of New Orleans tried unsuccessfully to seize control of the government

HISTORIC LOUISIANA

The Name *Louisiana* was given to the region by Sieur de La Salle when he claimed the entire Mississippi Valley area in 1682. He named it in honor of Louis XIV of France.

The Steamboat *New Orleans* completed the first steam-powered trip down the Mississippi in 1812, from Cincinnati to New Orleans in 82 days. By 1846, nearly 1,200 steamboats chugged up and down the river on regular schedules.

The Sugar Industry started in Louisiana in 1795, when Étienne de Boré found how to granulate sugar. Jesuits had brought the first sugar cane to the state in 1751.

The World's Longest Bridge, the Lake Pontchartrain Causeway, opened in 1956. The bridge crosses 24 miles of open water. It speeds motor traffic north from New Orleans to Mandeville, La.

Andrew Jackson defeated the British in the Battle of New Orleans on Jan. 8, 1815, with a small army of frontiersmen and pirates. The battle took place 15 days after the War of 1812 had ended because news of the treaty had not yet been received.

The French Opera House, built in 1859, was the center of cultural and musical life in New Orleans. The building was completely destroyed by fire in 1919.

in a battle on Sept. 14, 1874. See RECONSTRUCTION.

A new era began in Louisiana when President Rutherford B. Hayes withdrew the federal troops in 1877. During the next five years, Louisianians built new roads, schools, and churches. Commerce revived after 1879, when James B. Eads deepened the mouth of the Mississippi River, allowing large ocean-going ships to dock at New Orleans. The legislature adopted a new constitution in 1879, and moved the capital back to Baton Rouge in 1882. New Orleans had been the capital from 1865 to 1882.

Growth of Commerce and Industry. Railroads expanded rapidly in Louisiana as New Orleans increased in importance as a port. By 1883, New Orleans had rail connections with all the major cities in the United States. Foreign commerce in the city increased even more after the Panama Canal was completed in 1914.

The discovery of great mineral resources in the early 1900's stimulated industrial expansion. Fields of sulfur and petroleum created many new industries. The natural-gas field near Monroe opened in 1916, further enlarging sources of inexpensive power. Trunk-line railroads spread into every section of the state, and roads were improved.

During the administration of Governor John M. Parker (1920-24), the state launched a giant program to improve public works. Road building began to lift Louisiana out of the mud of its dirt roads. Parishes improved their school buildings and educational programs. A disastrous flood struck northern and south-central Louisiana in 1927, causing millions of dollars worth of property damage. That same year, the federal government joined with Louisiana in building vast flood-control projects.

Huey P. Long built a powerful political machine in Louisiana during the late 1920's. The people elected him as governor in 1928. He became practically a dictator, but his vigorous program of public works and social welfare helped develop the state. During Long's administration, the state extended its highway and bridge systems, enlarged the state university and state hospitals, and built a new Capitol at Baton Rouge. The state also began distributing free textbooks to school children. Long was assassinated in the Capitol in 1935. His political machine crumbled after the federal government indicted many leaders for fraud and other crimes in 1939. A reform party took control of the legislature in 1940, and Sam H. Jones became governor.

Recent Developments. During World War II, many new industries, including shipbuilding companies, began in Louisiana. New Orleans opened an International Trade Mart in 1948 to encourage foreign trade. Earl K. Long, a brother of Huey, served as governor from 1948 to 1952. Robert F. Kennon succeeded him in 1952, but Long was re-elected in 1956. In 1955, the U.S. Army Corps of Engineers began work to prevent the Mississippi River from changing its course away from Baton Rouge and New Orleans. The project includes construction of sea walls along the river to prevent the Mississippi from shifting its course into the Atchafalaya River. In the late 1950's, the state began building the Mississippi-Gulf Canal, a $95,000,000 tidewater channel. The 76-mile long canal was designed to cut about 40 miles from the old river route between New Orleans and the Gulf of Mexico, speeding ship movements in and out of the city. The industrial boom that began during World War II continued through the 1950's. The number of manufacturing plants in Louisiana doubled from 1939 to 1958. James H. Davis, governor from 1944 to 1948, was elected again in 1960.

Famous Louisianians

Separate biographies are listed under the heading Louisiana in the BIOGRAPHY section of the READING AND STUDY GUIDE. Governor Huey P. Long represents the state in Statuary Hall in the Capitol in Washington, D.C. The following short biographies include other noted persons who were born in Louisiana or did important work there.

Boré, Jean Étienne (1741-1820), developed a large-scale method of granulating sugar in 1795. Louisiana planters then began growing sugar cane as a major crop. Boré, sometimes called "De Boré," served as the first mayor of New Orleans after France took control of Louisiana in 1800. He was born at Kaskaskia, Ill.

Claiborne, William Charles Cole (1775-1817), served as the first governor of the Louisiana Territory, and in 1812 became the first governor of the state. Claiborne was elected as a Jeffersonian Republican to the U.S. Senate in 1816, but died before taking office. He was born in Sussex County, Virginia.

Ellender, Allen Joseph (1891-), served as a Democratic representative in the state legislature from 1924 to 1936, and entered the U.S. Senate in 1937. In 1949, Ellender made the longest unassisted filibuster speech in the history of the Senate. He talked for 12 hours and 20 minutes without rest. Ellender was born at Montegut.

Gayarré, Charles Étienne Arthur (1805-1895), was a noted Creole lawyer, statesman, and historian. He wrote a famous *History of Louisiana*. Gayarré, a Democrat, was elected to the U.S. Senate in 1835, but ill health forced him to resign before taking office. He served as Louisiana Secretary of State from 1846 to 1850. Gayarré was born in New Orleans.

Long, Russell Billiu (1918-), son of Huey P. Long, was elected as a Democratic U.S. Senator in 1948 to succeed the late Senator John H. Overton. He was re-elected in 1950 and 1956. Long had served as executive counsel to the Louisiana state government in 1948. He was born in Shreveport.

Martin, François-Xavier (1762-1846), a jurist and historian, served as chief justice of the state supreme court from 1836 to 1846. He simplified the French, Spanish, and English elements of Louisiana law. Martin also wrote histories of Louisiana and North Carolina. He was born in Marseille, France.

Saxon, Lyle (1891-1946), an author, wrote *Father Mississippi* (1927), *Fabulous New Orleans* (1928), *Old Louisiana* (1929), and a novel, *Children of Strangers* (1937). He was born in Baton Rouge.

Tulane, Paul (1801-1887), settled in New Orleans in 1822 and made a fortune in merchandising and real estate. He gave large sums to religious, charitable, and educational organizations, especially to the University of Louisiana. In 1883, the institution was renamed Tulane University. He was born near Princeton, N.J.

EDWIN A. DAVIS. Critically reviewed by FRED B. KNIFFEN

Related Articles in World Book include:

BIOGRAPHIES

An alphabetical list of biographies relating to Louisiana appears under the heading Louisiana in the BIOGRAPHY section of the READING AND STUDY GUIDE.

CITIES

Alexandria
Baton Rouge
Bogalusa
Lafayette
Lake Charles
Monroe
Natchitoches
New Orleans
Shreveport

HISTORY

Acadia
Beauregard, Pierre G. T.
Bienville, Sieur de
Civil War
Code Napoléon
Confederate States of America
Creole
Laffite, Jean
La Salle, Sieur de
Law, John
Long, Huey Pierce
Louisiana Purchase
Reconstruction
War of 1812

PHYSICAL FEATURES

Barataria Bay
Bayou
Delta
Gulf of Mexico
Gulf Stream
Jetty
Lake Pontchartrain
Levee
Mississippi River
Red River
Sabine River

PRODUCTS

For Louisiana's rank among the states in production, see the following articles:

Aluminum
Cotton
Gas (fuel)
Mining
Oyster
Petroleum
Rice
Salt
Shrimp
Strawberry
Sugar
Sweet Potato

UNIVERSITIES AND COLLEGES

Louisiana's universities and colleges which have separate articles are listed in a table in the *Education* section of this article.

UNCLASSIFIED

Evangeline Oak
Jazz
Mardi Gras
Southern States

Outline

I. The Land and Its Resources
  A. Location and Size
  B. Land Regions
  C. Coast Line
  D. Rivers, Bayous, and Lakes
  E. Natural Resources
  F. Climate
II. Life of the People
  A. The People
  B. Cities
  C. Country Life
III. Work of the People
  A. Agriculture
  B. Manufacturing and Processing
  C. Mining
  D. Forest Products
  E. Fishing and Fur Industries
  F. Electric Power
  G. Transportation
  H. Communication
IV. Education
  A. Schools
  B. Libraries
  C. Museums
V. The Arts
  A. Painting
  B. Literature
  C. Music
VI. Interesting Places to Visit
VII. Annual Events in Louisiana
VIII. Government
IX. History
X. Famous Louisianians

Questions

Who claimed Louisiana for France? How did the state get its name?

What is a *bayou*? How is it different from a river?

What is the "Evangeline country"?

What did Congress call the Territory of Louisiana after the state of Louisiana entered the Union?

Where are the "Florida parishes"? How did they get their name?

How does the legal system of Louisiana differ from those of other states?

What kind of tobacco grows only in Louisiana?

What historical event links Louisiana and Nova Scotia?

Where in Louisiana is the world's largest overwater highway bridge?

How does Louisiana help to encourage the development of new industries?

Books for Young Readers

BUCHANAN, W. C. *Louisiana Geography*. Harlow, 1957.

DAVIS, EDWIN A. *Louisiana: The Pelican State*. Louisiana State Univ. Press, 1959.

DORMON, CAROLINE. *Flowers Native to the Deep South*. Claitor's Book Store, Baton Rouge, La., 1958.

HUBBARD, MARGARET A. *Pennyweather Luck*. Macmillan, 1952. The Pennyweather family lives between the levee and the Mississippi River near New Orleans. This book shows how the lives of the Pennyweathers are affected by the great river.

JENKINS, LOUISE R. *Bayou Hunter*. Bobbs, 1958. This lively story about a family in the delta country of Louisiana has a strong Cajun flavor.

LENSKI, LOIS. *Bayou Suzette*. Lippincott, 1943. This story, set in the bayou country of Louisiana, describes the adventures of a 10-year-old girl and the customs of the people.

VINTON, IRIS. *We Were There with Jean Lafitte at New Orleans*. Grosset, 1957.

Books for Older Readers

DAVIS, EDWIN A. *The Story of Louisiana*. Hyer, 1960.

DAWSON, SARAH M. *A Confederate Girl's Diary*. Indiana Univ. Press, 1960. The diary of a Louisiana girl during the Civil War.

KANE, HARNETT T. *Bayous of Louisiana*. Morrow, 1943. The life and customs of the bayou people. *Deep Delta Country*. Duell, 1944.

Louisiana: A Guide to the State. Hastings, 1941.

LOUISIANA LEGISLATIVE COUNCIL. *The Government of Louisiana*. Baton Rouge, 1959.

LOWERY, GEORGE H. *Louisiana Birds*. Rev. ed. Louisiana State Univ. Press, 1960.

MCVOY, LIZZIE C., ed. *Louisiana in the Short Story*. Louisiana State Univ. Press, 1946. This book contains 15 stories by such authors as George W. Cable and Lafcadio Hearn.

OPOTOWSKY, STAN. *The Longs of Louisiana*. Dutton, 1960. A history of the Long dynasty and its significance for Louisiana.

SAXON, LYLE. *Fabulous New Orleans*. 2nd ed. Crager, 1950. *Old Louisiana*. 3rd ed. 1950.

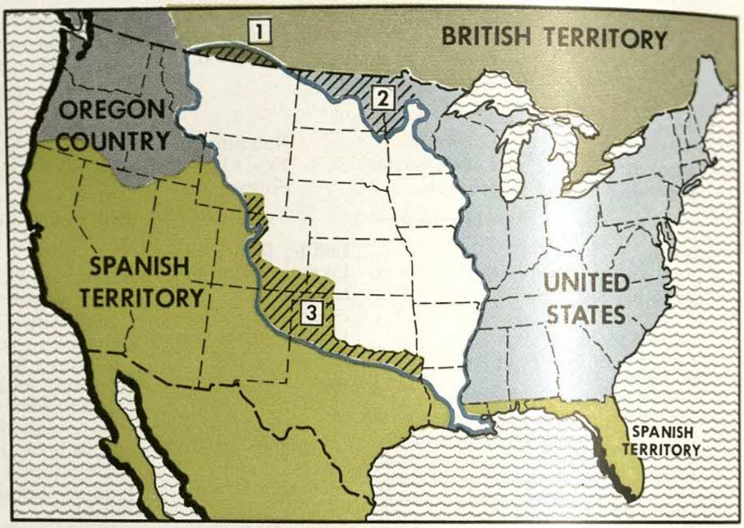
LOUISIANA, NORTHWESTERN STATE COLLEGE OF. See NORTHWESTERN STATE COLLEGE OF LOUISIANA.

LOUISIANA COLLEGE is a coeducational arts and sciences school at Pineville, La. It is controlled by the Louisiana Baptist Convention, but admits students of all faiths. Courses lead to the bachelor degrees. Louisiana college was founded in 1906. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LOUISIANA POLYTECHNIC INSTITUTE is a state controlled coeducational college at Ruston, La. It has schools of agriculture and forestry, arts and sciences, business administration, education, engineering, and home economics. Courses lead to bachelor's and master's degrees. The Institute was founded in 1894 as the Louisiana Industrial Institute, but took the name Louisiana Polytechnic Institute in 1921. For enrollment, see UNIVERSITIES AND COLLEGES (table). R. L. ROPP

The Louisiana Purchase was arranged in 1803. The French Minister of Finance, François de Barbé-Marbois, *right*, signed for France. James Monroe, *standing*, and Robert Livingston signed for the U.S.

The Louisiana Purchase—1803



The Louisiana Territory (outlined in blue) covered 825,000 square miles when purchased by the United States. Disputes over the numbered areas were later settled as shown, *right*.

1 Ceded to Great Britain, 1818
2 Ceded to United States, 1818
3 Ceded to Spain, 1819

LOUISIANA PURCHASE was the most important event of President Thomas Jefferson's first administration. In this transaction, the United States bought more than 825,000 square miles of land from France for about $15,000,000. This vast area lay between the Mississippi River and the Rocky Mountains, stretching from the Gulf of Mexico to the Canadian border. The purchase greatly increased the economic resources of the United States, and cemented the union of the Middle West and the East. Eventually all or parts of 15 states were formed out of the region.

Reasons for the Purchase. When Jefferson became President in March, 1801, the Mississippi River formed the western boundary of the United States. The southern boundary extended to the 31st parallel north latitude. The Floridas (with West Florida extending to the Mississippi and including New Orleans) lay to the south, and the Louisiana Territory to the west. Spain owned both these territories. Farmers who lived west of the Appalachian Mountains shipped all their surplus produce by boat down rivers that flowed into the Gulf of Mexico, especially the Mississippi. In a treaty of 1795, Spain agreed to give Americans the "right of deposit" at New Orleans. This right allowed Americans to store in New Orleans, duty-free, goods shipped for export. Arks and flatboats transported a great variety of products, including flour, tobacco, pork, bacon, lard, feathers, cider, butter, cheese, hemp, potatoes, apples, salt, whisky, beeswax, and bear and deer skins. The merchants exchanged the goods for Spanish currency and returned to their homes by keelboat or on horseback by way of Natchez. This arrangement was acceptable to western farmers, because Spain was a weak nation. If at any time Spain should close the Mississippi to American ships, the port of New Orleans might be seized.

Trouble Begins. In the same month that Jefferson became President, the United States minister to England, Rufus King, heard that Spain planned to give part of its American colonies to France. Jefferson feared that an ambitious nation such as France might interfere with the trade of the western territories. He believed that Spain would cede the Floridas to France, and quickly directed his diplomats to prevent this transfer. Secretary of State James Madison warned the French chargé d'affaires, Louis Pichon, that the United States expected to have an outlet to the sea. Robert Livingston, newly appointed minister to France, sailed for that country in September, 1801. He received instructions to inform the French government that the United States was not willing to see the American colonies of Spain transferred to any country except the United States.

In November, 1801, King sent Madison a copy of the treaty in which Spain ceded Louisiana to France. But Jefferson still did not know just how much territory this included. He instructed Livingston to prevent the cession if possible. If it had already taken place, Livingston was to persuade France to transfer the Floridas, especially West Florida, to the United States. New Orleans lay on the east side of the river, so it would become a possession of the United States. Napoleon spurned Livingston's proposals.

Events of 1802 brought little change in the situation. Napoleon planned to subdue a rebellion in France's West Indian colony, Santo Domingo. He also planned to send troops to take possession of Louisiana. But the French army in Santo Domingo was almost annihilated, and the transfer of Louisiana did not take place. Jefferson arranged for his friend, Pierre du Pont de Nemours, to carry dispatches to Livingston and to help him influence the French government against acquiring the American colonies. Du Pont's instructions read as follows: ". . . you may be able to impress on the government of France the inevitable consequences of their taking possession of Louisiana . . . This measure will cost, and perhaps not very long hence, a war which will annihilate her on the ocean . . ." Du Pont was to warn France that if it annexed Louisiana, the United States would form an alliance with England against France. Du Pont felt that this ultimatum might make Napoleon even more determined to acquire the desired territory. Being a businessman, he suggested that the United States offer to buy the Floridas, paying as much as $6,000,000 for them. This seems to be the first suggestion of buying the territory.

New Orleans Closed to Americans. Meanwhile, Jefferson's worst fears seemed to be confirmed when, on Oct. 18, 1802, the Spanish intendant, or governor, of New Orleans suspended the right of deposit. He was following orders received from Spain, probably dictated by Napoleon, but the action was made to appear as his own decision. The governor of the Mississippi Territory warned Madison: "The late act of the Spanish Government at New Orleans has excited considerable agitation in Natchez and its vicinity:—It has inflicted a severe wound upon the Agricultural and Commercial interests of this Territory, and must prove no less injurious to all the Western Country." Madison protested to the Spanish government and also warned Napoleon through Pichon that Americans were men of action and were aroused by a war fever.

Napoleon would not abandon his hopes of building an empire in America. The news of his army's defeat in Santo Domingo did not stop him, and he ordered 15,000 troops to that island. Livingston was discouraged. Jefferson decided to send James Monroe to France to support Livingston in his negotiations with the French government. Congress voted $2,000,000 which Livingston and Monroe could use in trying to purchase the east bank of the Mississippi. Jefferson privately advised the two envoys to offer as much as $9,375,000 for the Floridas and New Orleans. If France rejected their offer, they were to try to obtain at least the right of deposit at New Orleans.

Napoleon's Decision. Napoleon knew that war with Great Britain would soon break out again. Pichon warned him that the Americans might seize Louisiana as soon as France became engaged in a European war, and that the British Navy might seize the territory. Napoleon also feared the possibility of an Anglo-American alliance. Pichon had warned that the United States was considering sending 50,000 troops to take New Orleans by force. Clippings from American newspapers describing the war ferment seemed to substantiate this warning.

On April 10, 1803, Napoleon notified his finance minister, François de Barbé-Marbois, that he was considering ceding all the Louisiana Territory to the United States. Monroe arrived in Paris just after Marbois had offered Livingston the whole of Louisiana. Jefferson had instructed the two envoys to purchase only the Floridas, but they felt confident that the United States would accept this larger offer. They agreed to Marbois' price of 60,000,000 francs plus the assumption of American claims against France (a total of about $16,000,000). The treaty, dated April 30, reached Washington on July 14, 1803.

Ratifying the Treaty. Jefferson was uncertain about the course he should follow. The Federalists objected to the possible creation of a fringe of states that would differ in background and nationality from the original states. But Jefferson believed that Americans would inhabit any states thus formed in the natural course of expansion.

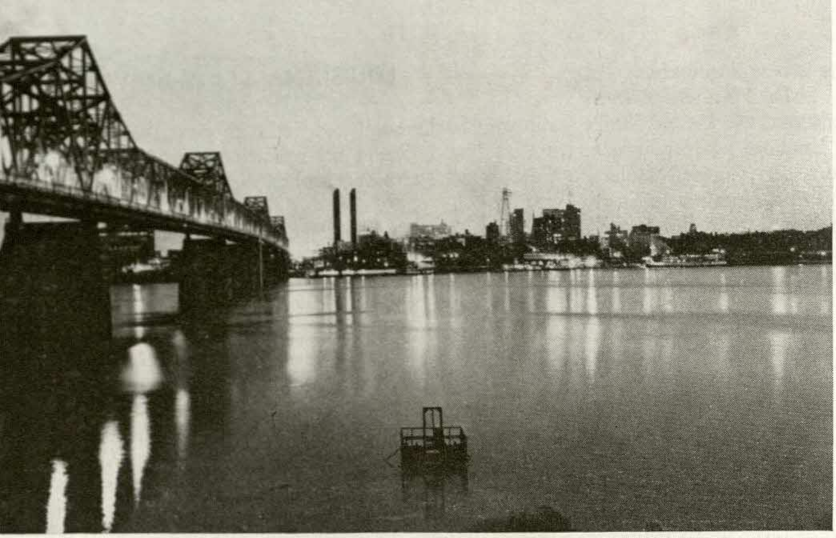
The Constitution did not authorize the acquisition of land, but it did provide for the making of treaties, so that Jefferson felt the acquisition of new territory was constitutional. He admitted that he had "stretched the constitution until it cracked." But he thought of himself as a guardian who made an investment of funds entrusted to his care. In a message to Congress on Oct. 17, 1803, Jefferson said: "Whilst the property and sovereignty of the Mississippi and its waters secure an independent outlet for the produce of the Western States and an uncontrolled navigation through their whole course, . . . the fertility of the country, its climate and extent, promise in due season important aids to our Treasury, an ample provision for our posterity, and a wide spread for the blessings of freedom and equal laws." Congress ratified the treaty on October 25, and passed laws to provide for borrowing the money from English and Dutch bankers, payable in 15 years.

Boundary Disputes arose over the Louisiana Territory, because the treaty did not state specific boundaries. The United States and Great Britain agreed in 1818 to establish the northern boundary at the 49th parallel. In the south, the United States claimed West Florida and part of Texas. Jefferson pointed out that as early as 1696 France had actual possession of the Gulf Coast from Mobile westward, and that in 1755 maps published by the French government showed the Perdido River as the eastern boundary of France's possessions. This, Jefferson claimed, was part of the land that Spain gave back to France in 1800, and therefore part of the purchase. In the treaty of 1819 with Spain, the United States purchased Florida, and surrendered its claim to Texas. Spain in return gave up its claim to West Florida. INA WOESTEMEYER VAN NOPPEN

See also LEWIS AND CLARK EXPEDITION.

LOUISIANA PURCHASE CENTENNIAL EXPOSITION was held in St. Louis, Mo., in 1904. It celebrated the 100th anniversary of the purchase of Louisiana. The United States bought the land from the French in 1803. The exposition had little permanent influence, although 42 states and 53 nations took part.

LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE is a coeducational school near Baton Rouge, La. It has schools of medicine and nursing education in New Orleans, the Francis T. Nicholls junior college at Thibodaux, the Caribbean Theatre program in the Panama Canal Zone, and a vocational agricultural school near Alexandria. Other divisions include colleges of agriculture, arts and sciences, chemistry and physics, commerce, education, and engineering; schools of law, music, and social welfare; and a graduate school. It was founded in 1845 at Alexandria, La., and held its first classes in 1860. It later became a land-grant college. School colors are royal purple and old gold. Athletic teams at Louisiana State University are known as the Tigers. Well-known school songs include "Fight for L.S.U." and "Touchdown for L.S.U." For enrollment, see UNIVERSITIES AND COLLEGES (table). TROY H. MIDDLETON



The Louisville Skyline at night shows part of downtown Louisville and the George Rogers Clark Memorial Bridge. The bridge, opened in 1929, replaced ferryboats in carrying traffic between Louisville and Jeffersonville, Ind.

Louisville Chamber of Commerce

LOUISVILLE, Ky. (pop. 390,639; alt. 450 ft.), is the largest city in the Bluegrass state. The Kentucky Derby, one of the world's most famous horse races, is held here each May at Churchill Downs. Louisville grew up as a transportation center between North and South, and as a processor of tobacco, whisky, meats, and wood products. The United States government keeps its gold reserve in massive vaults at Fort Knox, 30 miles south of Louisville.

Location and Size. Louisville lies on the Ohio River, which forms the northern boundary of Kentucky. People sometimes call it *The Falls City* because it has grown up beside the falls of the Ohio. A series of rapids makes the river drop 26 feet within one mile. These falls furnish hydroelectric power for the city. Five bridges across the Ohio connect Louisville with the Indiana cities of New Albany and Jeffersonville. Most of Louisville lies on a low plain formed by a curve in the Ohio River on the north and west. Low hills rise to the south and east. Louisville covers about 40 square miles. For location, see KENTUCKY (color map).

Industry and Commerce in Louisville produce about $800,000,000 worth of products annually. One district in the city has row after row of tobacco storage warehouses. Several distilleries produce whisky and beer. Other Louisville products include plumbing equipment, baseball bats, electric appliances, farm machinery, motor vehicles, dairy products, musical instruments, foundry products, farm machines, clothing, harnesses, stoves and furnaces, candy, and paints and varnishes. Photoengraving, oil refining, lumber milling, meat packing, and printing and publishing rank as other important industries. Louisville factories also produce synthetic rubber, petrochemicals, machinery, and frozen foods.

Transportation. Louisville is one of the nation's leading river ports. Towboats and barges carry freight from Louisville to other points on more than 30 branches of the Ohio and Mississippi rivers. These boats go around the Falls of the Ohio through the Portland Canal, a two-mile-long system. Louisville has the only inland Coast Guard lifesaving station in the United States except for those on the Great Lakes. Railroads connect Louisville with all parts of the country. Airlines use Bowman Field and Standiford Field in Louisville, and military planes use Godman Field at nearby Fort Knox.

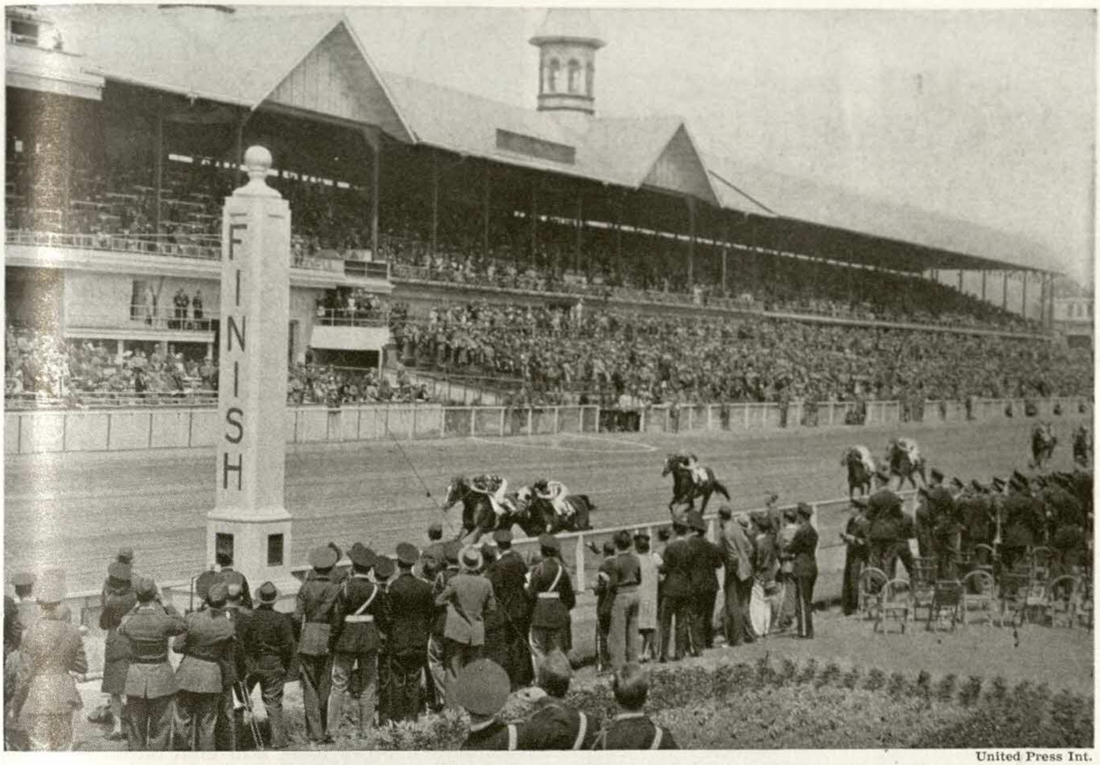
Cultural Life. Louisville's institutions of higher learning include the University of Louisville, the Jefferson School of Law, the Southern Baptist Theological Seminary, the Louisville Presbyterian Theological Seminary, Nazareth College, and Ursuline College. Also located here are the Kentucky School for the Blind and Bellarmine College. The Louisville Symphony Orchestra has won fame for commissioning new works by contemporary composers. The Speed Museum has a famous art collection, and the Filson Club houses a famous historical collection. The Louisville Free Library was one of the first public library systems in the United States. It was founded in 1816.

Interesting Places to Visit. Louisville has six major parks and 69 smaller parks and playgrounds. Cherokee Park (409 acres) includes golf links, tennis courts, playgrounds, and nearly 10 miles of paved roads. Iroquois Park (676 acres) has an open-air theater where musical comedy stars present summer shows. Other city parks include Central, Seneca, Shawnee, and Chickasaw. The Kentucky Fair and Exposition, covering 375 acres, ranks as one of the largest state fairs in the country. The offices and plant of the Louisville *Courier-Journal*, one of the nation's best newspapers, lie in downtown Louisville.

Louisville has several historical attractions, including the Zachary Taylor National Cemetery and Monument. A Confederate Monument honors the Southern dead of the Civil War. George Rogers Clark is buried in Cave Hill Cemetery. The American Printing House for the Blind produces books and pamphlets in Braille for persons throughout the country.

Government and History. George Rogers Clark, who explored the Northwest Territory, led settlers to the Louisville region in the winter of 1778-1779. Later settlement was made at the mouth of Beargrass Creek, named for the coarse grass growing at the place. The town was incorporated in 1828 and named for Louis XVI of France in thanks for French help during the Revolutionary War.

The first ocean-going ship to reach Louisville came down the Ohio from Elizabethtown, Pa., with a cargo of 720 barrels of flour, on June 16, 1800. In the fall of 1811, the first steamboat to reach Louisville, the *New*



United Press Int.

A Thrilling Finish at Churchill Downs, Louisville, Ky. Cheering crowds line the rail as a favorite is nosed out by a long shot seconds away from the finish line. This beautiful track is the home of the famous Kentucky Derby.

Orleans, docked there. Then as now, the Ohio River played a leading role in the development of the city.

Louisville's first race course, Oaklawn Track, opened in 1830. Sportsmen formed the Louisville Jockey Club in 1874. Each of the 320 original members subscribed $100, and Colonel M. Lewis Clark, a Kentucky horse breeder, used this money to build Churchill Downs, which opened in 1875.

During the Civil War, Louisville became known as *The Gateway City*, because of large Union troop movements by rail. Both Northern and Southern sympathizers lived in the city, but Louisville served as a supply depot for the Union Army.

Louisville adopted a new charter in 1893. A system of bureaus took over some of the duties that had been performed by the mayor and city council.

Louisville suffered a disastrous flood during January and February, 1937. The Ohio River overflowed most of the city, causing millions of dollars of damage. A flood wall now surrounds the river front to protect the city from future disaster.

Three government plants for the production of ammunition and naval ordnance, built in the early 1940's, supplied shells and bombs for American and Allied soldiers during World War II. Bowman Field served as an army training center.

Louisville grew rapidly during the mid-1900's. New industries and cultural activities aided the city's growth. In 1956, the new Kentucky State Fairgrounds opened in Louisville. Freedom Hall, a large auditorium, was opened. A reorganization of the city's highway system helped to redistribute both business and residential sections and contributed to Louisville's rapidly changing urban pattern.

THOMAS D. CLARK

LOUISVILLE, UNIVERSITY OF, is the oldest coeducational municipal university in the United States. It was established in 1798 in Louisville. The university has a college of arts and sciences; and schools of medicine, law, dentistry, music, social work, business, and engineering. There is also a graduate school. The engineering school, Speed Scientific School, was named for James Breckenridge Speed. There are also institutes of industrial research, medical research, art, and police science. Units of both U.S. Air Force and Navy ROTC are on campus. There is an annual summer session. The athletic teams of the University of Louisville are nicknamed the Cardinals. The school's colors are cardinal and black. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LOURDES, *loord* (pop. 15,829), is a town in southwestern France near the foothills of the Pyrenees. For location, see FRANCE (color map). It is famous as a shrine for Roman Catholic pilgrims, for it is believed that here, in 1858, the Virgin Mary appeared to a peasant girl, Bernadette Soubirous. A beautiful church, called the Rosary, and a statue of the Virgin stand at the grotto where the vision occurred. Thousands of persons visit these shrines every year, leaving gifts. Some leave their crutches as evidence of cure. Others bathe in the sacred waters of the grotto spring, in hope that a miracle will restore them to health. They come all year long. Many French Roman Catholics make a pilgrimage to Lourdes for ceremonies on August 20 of each year. The shrine at Lourdes attracts about 2,000,000 pilgrims a year. It is

Wide World

The Shrine at Lourdes marks the spot where many persons believe the Virgin Mary appeared to Bernadette Soubirous in 1858.

one of the greatest pilgrimage centers in the world. The underground Basilica of St. Pius X, opened in 1958, is the second largest Roman Catholic church in the world. Only St. Peter's in Rome can accommodate more people. ROBERT E. DICKINSON

LOURENÇO MARQUES, *loh RAYN soo mur KAYSH* (pop. 93,303), is the seaport capital of the Portuguese overseas province of Mozambique. It stands in the extreme southern part of Mozambique, on the shores of Delagoa Bay. For location, see MOZAMBIQUE (map).

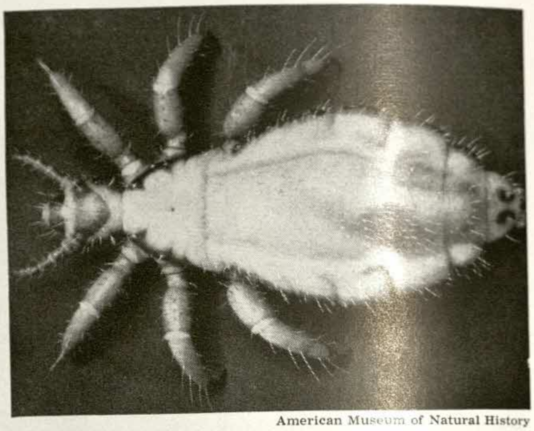
Lourenço Marques is connected by rail with several central African countries. By treaty, at least 47.5 per cent of the annual seaborne import tonnage to Johannesburg, Union of South Africa, must pass through Lourenço Marques. Over 1,200 ships a year berth at its docks, carrying about 4,000,000 tons of cargo. Chief imports include chemicals, machinery, paper, petroleum, and timber. Exports consist mainly of agricultural products and minerals. MARVIN HARRIS

LOUSE, *lous*, is a small insect that sucks the sap of plants or the blood of animals. Lice are animal and plant parasites.

Three kinds of lice prey on man—*head*, *body*, and *crab* lice. Body lice are the chief spreaders of typhus fever. These insects are the "cooties" that bother soldiers. Crab lice attack the pelvic region, armpits, and chest.

Lice that prey on humans are small, wingless creatures, with flattened, almost transparent bodies. They have hooked feet fitted for holding to hairs. The mouth part is a sucking organ like a beak. It is soft, but can pierce the skin so the animal can draw blood.

The oval eggs of lice are called *nits*. Head lice attach the eggs to hairs with a gummy substance. The nits hatch in six days. The louse is full grown 18 days later.

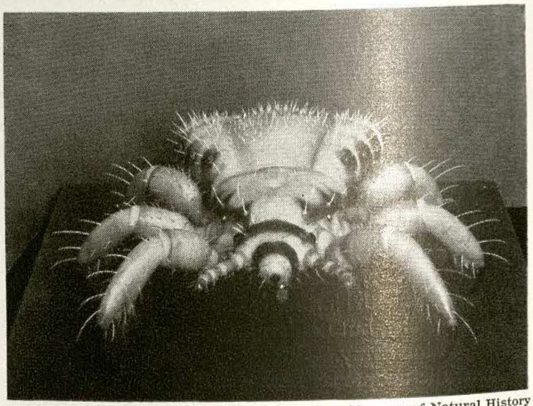


American Museum of Natural History

Top View of a Body Louse has been enlarged to show the tiny hairs that cover the body of this annoying pest.

It is easy for one person to catch lice from another. The best way to discourage both head and body lice is to keep the body clean. *Tincture of larkspur* is a good wash for head lice. It should be used about once a week until both lice and nits are destroyed. The larkspur also will kill crab lice. Body lice lay their eggs in the seams of clothing or bedding. It is necessary to steam or boil these articles to rid them of the pests.

A group of lice called *chewing lice*, or *biting lice*, eat feathers and bits of loose skin from birds. They also attack horses, raccoons, and other animals.



American Museum of Natural History

Front View of a Body Louse shows the crablike legs and hooked claws. A louse feeds by piercing its victim's skin and drawing blood through its beaklike sucker mouth.

Plant lice are called *aphids*. Some kinds of aphids are harmful to crops and garden plants. See APHID.

Scientific Classification. Lice make up two chief orders. Chewing lice, or bird lice, make up the order *Mallophaga*. True lice and sucking lice make up the order *Anoplura*. This order includes the lice that attack humans. The human louse, or body louse, is in the family *Pediculidae*. It is genus *Pediculus*, species *humanus*. Plant lice are in the order *Hemiptera*. H. H. ROSS

See also BIRD LOUSE; HEMIPTERA.

LOUSEWORT. See FIGWORT FAMILY.

L'OUVERTURE, TOUSSAINT. See TOUSSAINT L'OUVERTURE.

LOUVRE, *LOO vr'*, is the largest art museum and palace in the world. It covers 49 acres on the north bank of the River Seine in Paris. The Louvre has about 275,000 works of art, including about 5,000 paintings. Covering almost every period of art, these works may be seen in the museum's 140 exhibition rooms and eight miles of galleries. The 900-feet long Grand Gallery exhibits the world-famous painting, *Mona Lisa*, by Leonardo da Vinci. Masterpieces displayed on the first floor include the sculptures *Venus de Milo* and the *Winged Victory of Samothrace*, The second floor displays French works and decorative arts.

The Louvre houses the French Ministry of Finance and seven departments that form the museum. These departments hold collections on Greek and Roman antiquities, Egyptian and Oriental antiquities, paintings, sculpture, artistic treasures, and the decorative arts. The department in the Tuileries nearby exhibits impressionist paintings and contemporary works.

Philip Augustus built the first Louvre as a Gothic fort in the 1100's. In the 1300's, the fort became the royal residence. King Francis I, who had been a prisoner of war in Italy, decided to build a palace more splendid than the great palaces of Italy. In 1546, Pierre Lescot designed a building in the classical Renaissance manner. Jean Goujon, a Frenchman, did the sculpture. From then on, every French king of importance added buildings to the Louvre. The main portions of the Louvre were built during the reign of King Louis XIV. The additions included the central entrance of the Pavilion Sully and the monumental main façade along the River Seine with its imposing colonnade, completed in the late 1600's. The last addition to the Louvre contained the Pavilion Turgot. Architects completed it in the 1850's during the reign of Napoleon III. During the Franco-Prussian War in 1870, the French used the Grand Gallery as a munitions factory. Art collections were removed from the Louvre during World Wars I and II and sent into hiding. SIBYL MOHOLY-NAGY

LOVE APPLE. See TOMATO (History).

French Government Tourist Bureau

The Louvre in Paris ranks as one of the world's richest and most famous museums. *Winged Victory of Samothrace*, a masterpiece of Greek sculpture, is one of the prized treasures in the Louvre collections.

J. Horace McFarland

Love-in-a-Mist Has Double Flowers and Lacy Foliage.

LOVE-IN-A-MIST is a flower of the buttercup family. It is also called *devil-in-the-bush.* The blossom is blue or white in a mist of lacy green leaflike parts. But the seedpod at a glance resembles a devil's head hiding in a bush. The plant is an annual grown from seed. It grows 12 to 18 inches high. Flowers measure about 1 inch across.

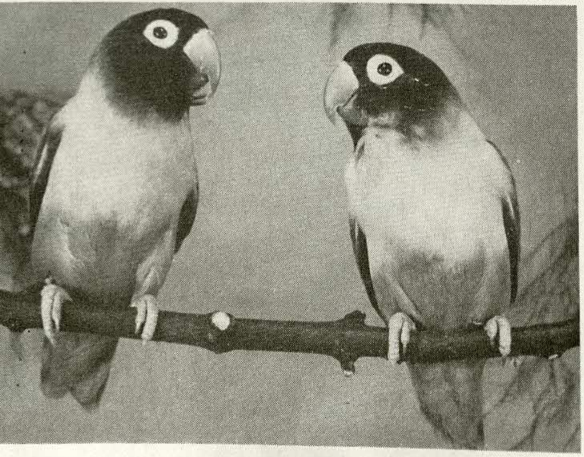
Scientific Classification. Love-in-a-mist belongs to the family *Ranunculaceae.* It is classified as genus *Migella,* species *damascena.* GEORGE A. BEACH

LOVE-LIES-BLEEDING. See AMARANTH.

LOVEBIRD is any one of several kinds of small parrots. They are called lovebirds because the mating birds show great affection, caressing each other with their bills and remaining in closely knit pairs. True lovebirds live in Africa, but a similar group inhabits the tropical regions of South America. Some African species have a remarkable way of carrying grass and straw to their nests. They tuck these materials under the feathers at the base of the tail. Then they fly to their nests with the grasses and straws streaming behind. Lovebirds in captivity often tear strips of paper or pick up pieces of string to tuck beneath their feathers.

Lovebird Parrots are prized as cage birds because of the great affection they show for each other during the mating season.

All Pets Magazine



Lovebirds have curved beaks and short tails that are typical of members of the parrot family. Many lovebirds are brilliantly colored. They are popular cage birds.

Scientific Classification. Lovebirds belong to the parrot family, *Bittacidae.* They are members of the genus *Agapornis* and of the genus *Psittacula.* HERBERT FRIEDMANN

See also BIRD (color picture, Family Pets); PARAKEET.

LOVEJOY is the family name of two American brothers who were abolitionist, or antislavery, leaders during the early 1800's.

Elijah Parish Lovejoy (1802-1837), a clergyman and editor, began to attack slavery as editor of the *St. Louis Observer.* Although threatened, he decided "to take my stand upon the Constitution," and refused to stop backing the abolition of slavery in the nation. He moved across the Mississippi River to Alton, Ill., in 1837. Here he published the *Alton Observer* and helped organize the Illinois Anti-Slavery Society. Two of his presses were wrecked, and, in November of 1837, a mob gathered to destroy his newest press. Lovejoy was killed while trying to stop the mob. Many Northerners became abolitionists after his death.

Culver

Elijah Lovejoy

Elijah Lovejoy was born in Albion, Me. He attended Waterville (now Colby) College and the Theological Seminary at Princeton, N.J.

Owen Lovejoy (1811-1864), a clergyman and statesman, served as a pastor at Princeton, Ill., for 17 years. He helped organize the Illinois abolitionist movement, but also helped persuade the Republican party to accept Abraham Lincoln's more cautious leadership. As a member of the U.S. House of Representatives from 1857 to 1864, he continued to denounce slavery while supporting Lincoln against the extreme abolitionists. Lincoln called the clergyman "my most generous friend."

Owen Lovejoy was born in Albion, Me., and attended Bowdoin College. LOUIS FILLER

See also ABOLITIONIST; PHILLIPS, WENDELL.

LOVELACE, RICHARD. See ENGLISH LITERATURE (The Cavalier-Puritan Period).

LOVE'S LABOUR'S LOST. See SHAKESPEARE, WILLIAM (table, The First Period).

LOW, ARCHIBALD M. (1888-1956), a British engineer and research physicist, won fame for inventions including a radio signaling system and a radio control for torpedoes, antiaircraft, and antitank rockets. In 1914, Low demonstrated the principles of television, and in 1946, he proved that machines could be propelled by rockets. Space travel and its possibilities also interested Low.

He received his technical training at the Imperial College of Science in London, and taught physics at the Royal Artillery College. IRA M. FREEMAN

LOW, DAVID. See CARTOON (Leading Cartoonists).

LOW, JULIETTE GORDON (1860-1927), founded the Girl Scouts in America. Among her close friends were Sir Robert and Lady Baden-Powell, the founders of Scouting. Mrs. Low organized a troop of Girl Guides on her estate at Glenlyon, Scotland. On her return to the United States, she began a patrol in Savannah, Ga., in 1912. In 1913, the organization changed its name to Girl Scouts (see GIRL SCOUTS). It was incorporated in 1915, and set up national headquarters in Washington, D.C. Mrs. Low served as president until 1920, when she received the title of Founder.

Girl Scouts

Juliette Gordon Low

She was born in Savannah, Ga., the daughter of a general. She married a wealthy Englishman, William M. Low, and lived in England, Scotland, and the United States. Mrs. Low was an eccentric person. However, she was a talented sculptor and a charming woman despite deafness and poor health. ALAN KEITH-LUCAS

LOW, SETH. See NEW YORK CITY (Famous New Yorkers).

LOW CHURCH. See EPISCOPALIANS.

LOW COUNTRIES are coastal regions between France and Germany. The Low Countries were once known as The Netherlands, but were later divided into Belgium, Luxembourg, and The Netherlands. Each of these countries has a separate article in WORLD BOOK.

LOW GERMAN. See GERMAN LANGUAGE.

LOWBOY. See COLONIAL LIFE IN AMERICA (Furniture).

LOWE, THADDEUS SOBIESKI COULINCOURT (1832-1913), organized and directed balloon reconnaissance and artillery spotting for the Union Army during the Civil War (see BALLOON [Balloons in War]). Lowe also used balloons to study air currents, and made several long voyages, including one from New York City to New Orleans. He believed that balloons might some day carry passengers across the Atlantic Ocean. Lowe was born in Jefferson Mills, N.H. ROBERT B. HOTZ

LOWELL, Mass. (pop. 92,107; alt. 100 ft.), is one of the leading manufacturing cities in the state. It stands along the Merrimack River, about 25 miles from Boston (see MASSACHUSETTS [color map]). The city is the home of Lowell Technological Institute and one of the Massachusetts state colleges. It preserves the birthplace of painter James Abbott McNeill Whistler as a museum.

The Lowell area was a part of the town of Chelmsford until 1822. In that year, the Merrimack Manufacturing Company developed the water power of the river. This attracted cotton mills to the area. The town was named after Francis Cabot Lowell, who built the first true cotton factory at Waltham in 1814. Lowell was incorporated as a town in 1826, and as a city in 1836. It has a council-manager form of government. It is a seat of Middlesex County.

Lowell was a company town when first established. The girls who came to work in the cotton mills lived in company dormitories, and were governed by company rules. The industry expanded so rapidly that some companies sent agents to Europe to get workers. Cotton manufacturing remained Lowell's only industry throughout the 1800's. The city was hit hard by changing fashions and the movement of the industry to the South after World War I. Textile manufacturing is still the leading industry, but the largest single employer in the city makes electronic equipment. Other products include cookies, corduroy, electric motors, phonographs and radios, radio and television cabinets, shoes, temperature controls, and wire and cable cords. WILLIAM J. REID

LOWELL, ABBOTT LAWRENCE (1856-1943), president of Harvard University from 1909 to 1933, had great influence on college education through his writings, speeches, and leadership. He believed that a student should major in one field of study, but should also broaden his knowledge by taking courses in other fields. He wrote several books on higher education and political science. Lowell was born in Boston and studied at Harvard. He was the brother of the astronomer Percival Lowell and the poet Amy Lowell. GALEN SAYLOR

LOWELL, AMY (1874-1925), was an American poet and critic. She is best known for *Sword Blades and Poppy Seeds*, which was published in 1914. This book drew attention to "free verse," or "unrhymed cadence," as she called it. Her first experiments with "polyphonic" prose, a free-verse method, also appeared in this volume.

Amy Lowell became leader of the "Imagist" school. This was a group of poets who placed emphasis on the images in poetry. Among her most popular poems are "Patterns" and "Lilacs."

In 1922 she published *A Critical Fable*, a book of humorous critical verse. The peculiar rhythms imitated *A Fable for Critics*, by James Russell Lowell, her cousin. *What's O'Clock* (1925) was awarded the 1926 Pulitzer prize for poetry. Many critics believe that her most important work is not her poetry, but her biography, *John Keats*, published the year of her death.

Amy Lowell was born in Brookline, Mass., of a well-known New England family. She was educated in private schools, and spent most of her early life in Brookline and Boston. Her poems describe many details of her childhood. In 1912, after considerable travel abroad, she published her first book, *A Dome of Many-Coloured Glass*. Most of these poems were written in conventional meter and rhyme, and attracted little attention. Her works in verse also include *Men, Women, and Ghosts* (1916); *Pictures of the Floating World* (1919); *East Wind* (1926); and *Ballads for Sale* (1927). Her literary criticism includes *Six French Poets* (1915) and *Tendencies in Modern American Poetry* (1917). From 1915 until her death, she lectured at Harvard, Yale, Columbia, and at other colleges and universities throughout the United States. PETER VIERECK

Amy Lowell

Brown Bros.

LOWELL, FRANCIS CABOT (1775-1817), an American textile manufacturer, founded the first mill that carried through the entire cotton-manufacturing process from raw material to finished cloth. In 1810, Lowell was allowed to inspect the Lancashire cotton mills in England. On his return, he and Paul Moody designed spinning and weaving machinery superior to the best English models. Lowell installed these machines in a mill at Waltham, Mass., which he and others had established in 1814. He also planned good living conditions for his workers. After his death, his associates put this plan into effect in the industrial city of Lowell, Mass., which was named for him.

Lowell was born in Newburyport, Mass. He attended Harvard University and was graduated in 1793 with highest honors in mathematics. Kenneth W. Porter

LOWELL, JAMES RUSSELL (1819-1891), is remembered today as an outstanding American poet. In his own time he was known equally well as a literary critic, teacher, and diplomat. His poetry shows forceful expression, wit, and common sense. It does not have the grace and simplicity of Henry Wadsworth Longfellow's poems and is not so rhythmical or musical as Edgar Allan Poe's verse. But it contains many beautiful phrases and lines.

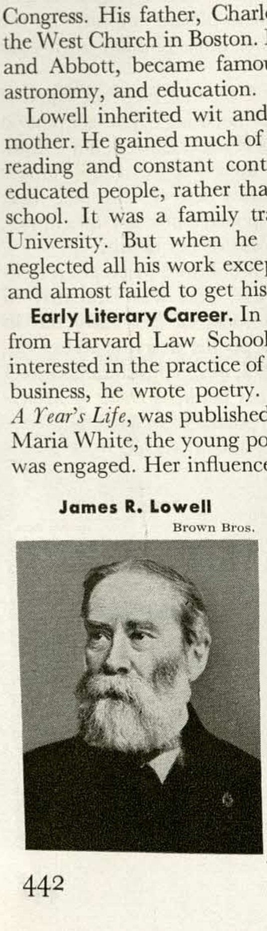
New England Background. Lowell was born on Feb. 22, 1819, in Cambridge, Mass. His family was a distinguished one, and his early life was happy. His grandfather had been a member of the Second Continental Congress. His father, Charles Lowell, was minister of the West Church in Boston. His cousins, Amy, Percival, and Abbott, became famous in the fields of poetry, astronomy, and education.

Lowell inherited wit and a love of poetry from his mother. He gained much of his education through wide reading and constant contact with nature and with educated people, rather than by regular attendance at school. It was a family tradition to attend Harvard University. But when he went to Harvard, Lowell neglected all his work except literature and languages, and almost failed to get his degree.

Early Literary Career. In 1840, Lowell was graduated from Harvard Law School, but he was never much interested in the practice of law. While waiting for legal business, he wrote poetry. His first volume of poems, *A Year's Life*, was published in 1841. He dedicated it to Maria White, the young poet and reformer to whom he was engaged. Her influence on Lowell was great, especially after their marriage in 1844. She led him to take a stand against slavery and to support other reform movements. She died in 1853.

James R. Lowell

Brown Bros.



In 1843, Lowell helped to found *The Pioneer*, a magazine for which Poe, Hawthorne, and others wrote. In spite of its quality, *The Pioneer* failed financially. In 1843 and 1848, two more volumes of *Poems* by Lowell appeared.

During the Mexican War, Lowell began his *Biglow Papers*. The first of these political satires in verse appeared in the Boston *Courier* in 1846. It was written in Yankee dialect, supposedly by one of the paper's subscribers, Hosea Biglow. Soon the real author became known. Lowell's fame spread as the series became widely popular through the sly humor, irony, and political philosophy of its New England characters. In 1848, Lowell produced his best-known poem, "The Vision of Sir Launfal." See Launfal, Sir.

Literary Critic and Professor. *The Fable for Critics*, another long poem, appeared in 1848. It proved Lowell to be one of the foremost critics of the day. The poem was characterized by puns and sharp ridicule. His later work as a literary critic took the form of essays, as did his political writing.

In 1851, Lowell visited Europe with his family. He went again in 1855, after his wife's death. These trips helped fit him to follow Longfellow as professor of modern languages at Harvard. He took this post in 1855. As an instructor, he was especially successful in making his students think and in awakening them to an appreciation of the beauties of literature. In 1857, he was married to Frances Dunlap, with whom he lived happily for more than 25 years.

During Lowell's early career as a professor, he took on for two years the added duties of editing the newly founded magazine, *Atlantic Monthly*. From 1863 to 1872, he was one of the editors of the *North American Review*. Much of his best prose appeared in these magazines.

Later Poetry. Lowell wrote a second series of *Biglow Papers*, which appeared in the *Atlantic Monthly*. It was collected for publication in book form in 1867. The first series had been inspired by the Mexican War. When the Civil War began, Lowell again let Hosea Biglow express his opinions on political questions.

At the close of the war, Lowell wrote his *Commemoration Ode* in honor of Abraham Lincoln and the Harvard graduates who had died in battle. He himself had lost eight relatives in the war, and his heart was in the poem.

Diplomatic Service. In 1872 Lowell again visited Europe for study and observation. English literary leaders welcomed him, and Oxford and Cambridge universities conferred honorary degrees on him. At home and abroad, he was considered a representative of the best American culture. President Rutherford B. Hayes appointed him United States Minister to Spain in 1877. Lowell had been a presidential elector the year before, and had supported the Republican party in his writings.

After three years in Spain, Lowell was transferred to England. His diplomatic duties required little of him except to build up good will for the United States. But his uprightness, learning, humor, and brilliant oratory made him a prominent man in England. In 1885, his second wife died, and in the same year he was called back to America.

In Cambridge once more, Lowell was still a public figure. His mind remained vigorous, and no great occasion was properly celebrated without a word from him. He made the principal address on the two hundred and fifteenth anniversary of the founding of Harvard University. He collected a volume of his verse, and in 1886 he published some of the speeches he had made in England, using one on *Democracy* for the volume title.

His other works include the books of verse, *Under the*

Willows (1868), *The Cathedral* (1869), and *Memorial Poems* (1876); and his prose works, *Fireside Travels* (1864), *My Study Windows* (1874), *Among My Books* (1876), *Democracy* (1886), and *Political Essays* (1888).

On Aug. 12, 1891, Lowell died at Elmwood, the colonial house in Cambridge where he was born and where he lived most of his life. JOHN TYREE FAIN

See also ABOLITIONIST.

LOWELL, PERCIVAL (1855-1916), an American astronomer, became best known for his belief in the possibility of life on Mars and in the existence of canals there. He began his career as a businessman. Soon, however, his interests turned to astronomy. In 1894, he completed the Lowell Observatory at Flagstaff, Ariz. He wrote several books which had wider popular appeal than scientific value. In 1905 his studies led him to predict the discovery of the planet Pluto (see PLUTO). Lowell was born in Boston. HELEN WRIGHT

LOWELL, ROBERT (1917-), achieved fame for his lyrical poems of concentrated intensity. His second book, *Lord Weary's Castle* (1946), won the 1947 Pulitzer prize for verse. His other books include *Land of Unlikeness* (1944) and *The Mills of the Kavanaughs* (1951). His many literary honors include the poetry consultancy at the Library of Congress from 1947 to 1948. Born in Boston, Lowell was educated at Harvard University and Kenyon College. He later taught literature courses at Kenyon and at Boston University. PETER VIERECK

LOWELL TECHNOLOGICAL INSTITUTE is a state-controlled coeducational school at Lowell, Mass. It is the only institution giving four-year degree courses on the undergraduate level in leather engineering, plastics engineering, and electronics engineering. It also offers courses in paper and textile engineering, and in textile chemistry. The institute has complete manufacturing equipment for all major textile fibers. The Lowell Technological Institute Research Foundation uses this equipment in research, testing, and development work for the government and for industries. Lowell was founded in 1895. For enrollment, see UNIVERSITIES AND COLLEGES (table). EARL J. WATT

LOWER CALIFORNIA. See BAJA CALIFORNIA.

LOWEST COMMON DENOMINATOR. See FRACTION.

LOWESTOFT WARE. See PORCELAIN (Chinese Chinaware; China Factories in Europe).

LOWLANDS. The Netherlands is generally regarded as the best example of a lowland country, and the life of its people is typical of that of lowlanders. See NETHERLANDS; also BELGIUM (Transportation); GERMANY (Location); SCOTLAND (Land Regions).

LOYAL ORDER OF MOOSE. See MOOSE, LOYAL ORDER OF.

LOYALIST, UNITED EMPIRE. See UNITED EMPIRE LOYALIST.

LOYALIST PROVINCE. See NEW BRUNSWICK.

LOYALTY ISLANDS are a chain of islands 150 miles long in the South Pacific Ocean. They lie parallel to New Caledonia and about 70 miles northeast of it. For location, see PACIFIC OCEAN (color map). The Loyalty Islands are governed by France as part of New Caledonia. The three largest islands are Lifou, Mare, and Uvea. The islands are formed of uplifted limestone, rising from the sea in cliffs as high as 200 feet. The total land area of the islands is 800 square miles.

Ewing Galloway

An Old Mission on Lifou, One of the Loyalty Islands

The Loyalty Islands have a population of 11,000. Most of the people are Melanesians, husky and bushy-haired. In some villages there are people with lighter skin and straight hair, related to the Polynesians. The men are skilled sailors.

The soil on the Loyalty Islands is thin, but fertile. The rainfall is heavy, but there is often a lack of water because the rain soaks through the porous rocks. There are no streams, so deep wells are dug to furnish water. Sometimes drinking water is collected from pools formed in caves. Many of the islanders drink only coconut milk.

The chief products of the Loyalty Islands are coconuts, bananas, taros, and yams. The chief export is copra, the dried meat of coconuts, which is used to make coconut oil. EDWIN H. BRYAN, JR.

LOYOLA, *loy OH luh,* **SAINT IGNATIUS,** *ig NAY shih us* (1491-1556), was a Spanish noble who began life as a soldier. Later he turned to the service of the Roman Catholic Church and founded the Society of Jesus, better known as the Jesuits.

He was born in the castle of Loyola near the Spanish town of Guipúzcoa, and was christened Íñigo López de Recalde. After he had learned to read and write a little, he was sent as a page to the court of Ferdinand and Isabella. There he received the usual training of a young Spanish nobleman. He learned to ride, to carry arms, and to do all the things a young courtier should know how to do. Then he joined the soldiers of the Duke of Najera.

Young Recalde was seriously wounded during a war with France. He was ill for weeks. While he was getting well he read two books, *The Life of Christ* and *Flowers of the Saints*. They changed his whole life. He gave up the pleasures of the world to serve the Church, and took the name of IGNATIUS LOYOLA.

He spent a year in a convent at Manresa, and then wandered as a pilgrim, helping those in need. He also preached and visited holy places. In 1524 he entered a grammar school in Barcelona. Later he studied in the universities of Barcelona, Alcalá, and Salamanca. A seven-year course at the University of Paris finished his education.

A group of seven young men formed the Society of Jesus in Paris in 1534. Loyola was one of them. Pope Paul III gave the society his approval six years later, and Loyola was elected the first general of the society. After that he devoted himself to the writing of its *Constitutions* and *Spiritual Exercises.* The Jesuits owe their greatness to his ability and foresight. He provided for strict discipline in the organization of the Jesuits, and insured their unity and strength. He planned the educational system that produced some of the great Roman Catholic theologians. Loyola died in 1556 after a short illness. But the society he founded lives on. He was beatified in 1609 and made a saint in 1622. His feast day is July 31. FULTON J. SHEEN

Brown Bros.

Saint Ignatius Loyola

See also JESUIT.

LOYOLA COLLEGE is a college of liberal arts and sciences in Baltimore, Md. It is directed by the Jesuit order of the Roman Catholic Church. Students of all faiths are admitted, but only men may attend day sessions. Evening classes and graduate programs are coeducational. It was founded in 1852. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LOYOLA UNIVERSITY is a coeducational liberal arts school in Chicago. It is conducted by the Jesuits. The Lake Shore campus day classes and the dental school are for men. The graduate school and evening arts college at Lewis Towers are coeducational. There are also schools of commerce, nursing, law, social work, and a college of arts and sciences. The Medical Center includes the Stritch School of Medicine. The West Baden College in Indiana offers advanced education for Jesuits. Loyola was founded in 1870. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LOYOLA UNIVERSITY is a private, coeducational school at New Orleans, La. It is conducted by the Roman Catholic Jesuits. Loyola has colleges of arts and sciences, business administration, music, and pharmacy; and schools of law and dentistry. It also has graduate courses in education, and an evening division. There are no student residence halls. There is an army ROTC unit on campus, and an amateur radio station. Loyola participates in the United States International Exchange program. Loyola University was founded in 1904. For enrollment, see UNIVERSITIES AND COLLEGES (table). J. A. TOOMEY

LOYOLA UNIVERSITY OF LOS ANGELES is a men's school in Los Angeles, conducted by the Jesuits. Courses in arts, science, business administration, premedicine, engineering, and law lead to bachelor's degrees, and master's degrees in education and English. Law courses are open to women. The school was founded in 1911. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LOZENGE, *LAHZ enj,* is the name given to a small tablet of medicine or piece of candy. See CANDY.

LP-GAS. See BUTANE AND PROPANE; GAS (Liquefied Petroleum Gas).

LUANDA, *loo AN duh* (pop. 141,647; alt. 35 ft.), a seaport, is the capital and largest city of Angola. For location, see ANGOLA (map). It exports coffee, corn, sugar, cotton, and diamonds. Chief manufactures include soap and tobacco products, and wood veneers.

LUAU. See HAWAII (The People).

LUBBOCK, *LUB uhk,* Tex. (pop. 128,691; alt. 3,190 ft.), is the third largest inland cotton market in the world. The city also serves as a transportation, trade, and warehousing center, and is often called *the Hub of the Plains.* It lies on the southeastern edge of the High Plains of western Texas. For location, see TEXAS (color map).

The area around Lubbock contains the largest known oil and gas reserves in the nation. Farms in the region produce cotton, grains, and sorghum. The city has over 125 manufacturing plants. Lubbock is the home of Texas Technological College. Mackenzie State Park, the most popular park in Texas, lies in the city.

Lubbock was established as a compromise between two rival town builders, both of whom located town sites in the area in 1890. In 1891, the two owners agreed to consolidate, move to a third location, and call the town Lubbock. The rapid growth of the petroleum industry and irrigation farming boosted the population of Lubbock 75 per cent between 1950 and 1960. The city is the seat of Lubbock County. It has a commission-manager government. H. BAILEY CARROLL

LÜBECK, *LYU behk* (pop. 230,100; alt. 39 ft.), is a shipping and manufacturing center in West Germany. It lies on the Trave River, near the Baltic Sea (see GERMANY [color map]). A natural harbor made the city an important trading point almost from the time it was founded in the mid-1100's. Lübeck became a free city in the early 1200's (see FREE CITY).

During the Middle Ages, Lübeck was the recognized leader of a union of German cities known as the Hanseatic League. The league dissolved when new trade routes were opened to America, and Lübeck lost much of its importance. JAMES K. POLLOCK

See also HANSEATIC LEAGUE.

LÜBECK, TREATY OF. See THIRTY YEARS' WAR (The Danish Period).

LUBITSCH, *LUH bich,* **ERNST** (1892-1947), a motion-picture producer and director, became noted for charming and sophisticated comedies. He first worked as an actor in Germany, but soon turned to producing motion pictures. He produced *Gypsy Blood* and *Passion* in 1918. Lubitsch went to Hollywood, Calif., in 1923 to direct Mary Pickford. He produced or directed such motion pictures as *Love Parade, Trouble in Paradise, The Merry Widow,* and *Ninotchka.* Lubitsch was born in Berlin, Germany. BARNARD HEWITT

LUBLIN, *LOO bleen* (pop. 114,000; alt. 590 ft.), is the capital of Lublin province in Poland. It lies 100 miles southeast of Warsaw, and is a center of trade for the grain and farm products of the surrounding territory. For location, see POLAND (color map).

LUBRICANT is a substance used to reduce friction between the moving parts of a machine or other device. Without lubricants, the friction would wear one part away, or the two parts would become so hot that they would stick together. The machine would soon stop. A thin film of oil or grease placed between the moving parts prevents friction damage in most machines. The machine parts meet little resistance as they slide over this slick film. The ideal lubricant reduces frictional resistance to the same degree as that in a liquid flowing over itself.

The three chief kinds of lubricants are: (1) liquid lubricants, (2) partly solid lubricants, and (3) solid lubricants.

Liquid Lubricants, the most widely used type, come from crude oil. They differ widely in weight, thickness, and boiling point. Common household oil is a liquid lubricant. So is the oil that is used in automobile engines.

Different weights of lubricants work best under different temperature conditions. For example, cold air thickens heavy oil, and the lubricant offers resistance to moving parts. Because of this, car owners use a thinner oil in cold weather. Warm air causes oils to become thinner. In summer, car owners use a heavier oil than in winter.

Jet engines require special lubricants because of the tremendous heat they produce. Castor oil has been adapted for use as a lubricant for some types of jet engines.

Partly Solid Lubricants are thick greases made from petroleum or animal and vegetable oils. They usually contain soap that acts as a binding substance. Greases are used in places where liquid lubricants would flow away. For example, the axles of vehicles are usually greased instead of oiled.

Solid Lubricants come from minerals such as graphite, a form of clay. These lubricants find their greatest use on wood or rough metal. They create a slippery surface so that moving parts can easily slip over one another under a heavy load. Other solid lubricants include mica and wool yarn. George L. Bush

See also Castor Oil; Friction; Graphite; Oil.

LUCANIA MOUNTAIN. See Mount Lucania.

LUCAS, ELIZA. See Pinckney, Elizabeth.

LUCAS, ROBERT. See Iowa (Famous Iowans).

LUCE, CLARE BOOTHE (1903-), became the first woman to represent the United States in a major diplomatic post. As ambassador to Italy from 1953 to 1957, she helped settle the dispute between Italy and Yugoslavia over Trieste. Mrs. Luce represented Connecticut in the U.S. House of Representatives from 1943 to 1947. She keynoted the 1944 Republican national convention, and campaigned actively in 1940, 1944, and 1952 to help the party's presidential candidates. In 1959, the U.S. Senate, after a bitter debate, approved her appointment as ambassador to Brazil. As a result of this political quarrel, Mrs. Luce resigned the ambassadorship a few days after winning Senate approval.

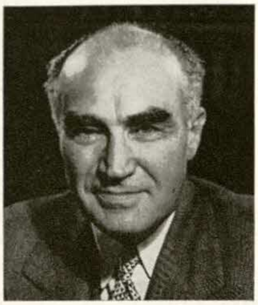
Clare Boothe Luce

United Press Int.

Mrs. Luce wrote and produced her first play in high school. She became an editor of *Vogue* magazine, and served as managing editor of *Vanity Fair* magazine from 1933 to 1934. She wrote several plays, including *The Women* (1937), *Kiss the Boys Good-bye* (1938), and *Margin for Error* (1939). After joining the Roman Catholic Church in 1946, Mrs. Luce wrote much on religious subjects.

She was born in New York City, and was educated in private schools. In 1935, she was married to Henry R. Luce (see Luce, Henry R.). Richard L. Watson, Jr.

LUCE, HENRY ROBINSON (1898-), achieved fame as one of the foremost publishers and editors of the United States. His news weekly, *Time* Magazine, added many new words and introduced twists of writing to the American language.



Time, Inc.

Henry R. Luce

Life Magazine, the pictorial weekly that Luce started in 1936, has had many imitators.

Luce and his friend Briton Hadden founded *Time* Magazine in 1923, and in 1930 Luce started another periodical, *Fortune*, a deluxe monthly for businessmen. His radio program, *March of Time*, began in 1931, and a series of the same name began as newsreels in 1935. Both were abandoned in 1953. Luce purchased *Architectural Forum* in 1932 and launched another periodical, *House and Home*, in 1952. In August, 1954, the first issue of his *Sports Illustrated* appeared. Luce was born in Tengchow, China, the son of Presbyterian missionaries. He was graduated from Yale University. He is married to the playwright, Clare Boothe Luce (see Luce, Clare Boothe). Kenneth N. Stewart

LUCERNE, *loo SURN*, officially Luzern (pop. 63,600), is an attractive city on the banks of Lake Lucerne in Switzerland. For location, see Switzerland (color map). The River Reuss divides the city into two parts.

The modern part is on the west. The old town, which dates from the Middle Ages, is on the east. The most famous landmarks of the city are the two roofed bridges. One of them has on its inner walls a series of paintings from the early 1600's. Other landmarks include the old town hall, with its collection of art and antiques, and the famous "Lion of Lucerne." This is a huge lion carved in solid rock as a memorial to the Swiss Guards who died defending the Tuileries. Franklin C. Erickson

LUCERNE, or **LUCERN.** See Alfalfa.

LUCERNE, LAKE OF. See Lake of Lucerne.

LUCERNE, LION OF. See Lucerne; Swiss Guards; Thorvaldsen, Bertel (picture).

LUCHUS. See Ryukyu Islands.

LUCIA DI LAMMERMOOR. See Opera (Famous).

LUCIAN. See Greek Literature (The Graeco-Roman Age).

LUCIFER is a Latin word meaning *light-bringing*. It was sometimes applied to the moon. But more often it was used to mean the planet Venus as the morning star (see Evening Star; Venus). The poetic meaning, *the day*, came from this usage. A myth grew up later about some wicked angels who married human wives. These angels were attacked by archangels and thrown into the abyss of fire. The Lucifer mentioned in the Bible (Is. 14), may be a king of Babylon. Lucifer was one of the leading characters in John Milton's *Paradise Lost*. Now the word Lucifer had become almost a synonym for Satan, the symbol of all wickedness.

LUCIN CUTOFF. See Great Salt Lake.

LUCITE is the Du Pont Company's trademark for one of the most widely used acrylic plastics. It has high crystal-like transparency, and freedom from haze or color. But colors can be added, and products made of Lucite can be obtained in a wide range of transparent, translucent, and opaque colors.

Lucite combines a pleasing appearance with many useful properties. It has great ability to stand outdoor exposure. In addition, Lucite is a good electrical insulator. It is resistant to wear, and to most common chemicals.

Because Lucite is clear and because it can be made with a perfectly smooth surface, it has the ability to transmit, or "pipe," light around curves. This fact may be demonstrated by directing a beam of light into the end of a long Lucite rod which, with the aid of heat, has been tied into a knot. The light, scarcely seen throughout the length of the rod, emerges from the other end. Dentists and surgeons use instruments made of Lucite to illuminate body cavities in dentistry and surgery.

Use has been made of the light-piping of Lucite in "edge-lighted" murals, screens, panels, and signs. If one edge of a sheet is supported in a frame directly above a fluorescent tube, and if the surface of the sheet is perfectly smooth, the light will be carried through it to emerge at the opposite edge. But if the surface of the sheet is carved or otherwise roughened in a decorative pattern or lettering, the pattern will glow with the light that escapes where the smooth surface has been broken.

Lucite molding powders are used in the manufacture of lenses and reflectors for automobile tail and stop lights, and in hundreds of other articles.

Lucite is made from *methyl methacrylate*, one of several important synthetics which may be derived from elements of coal, air, and water.

LUCIUS is the name of three popes of the Roman Catholic Church. Each pope ruled during troubled times. Their reigns were:

Lucius I, Saint	(253-254)
Lucius II	(1144-1145)
Lucius III	(1181-1185)

Saint Lucius I permitted Christians who lapsed during imperial persecutions to be readmitted to the Church after doing penance.

Lucius II was pope during the time of a Roman Republic. He built monasteries in Germany and Italy. He was killed in a battle with rebellious Romans.

Lucius III called a synod in 1184 to condemn the Albigenses and Waldenses for heresy (see Albigenses; Waldenses). Thomas P. Neill and Fulton J. Sheen

Harris & Ewing

Count Felix von Luckner

LUCKNER, *LOOK ner*, **COUNT VON** (1881-), Felix Luckner, a German naval officer, was one of the most colorful figures of World War I. He first saw service in 1916 at the battle of Jutland on the North Sea. Later, he disguised a small ship as a Norwegian fishing boat and sailed through the British blockade. He is said to have sunk 25 Allied ships. His ship, the *Seeadler (Sea Eagle)*, eventually was wrecked, and he was captured by the British. Luckner was freed after the war.

After World War I, Luckner lived for several years in the United States, where he often lectured about his adventures. During World War II, the Nazis imprisoned him for a time. When the Americans approached the city of Halle in 1945, Luckner arranged for its surrender. He was born in Dresden. Gabriel A. Almond

LUCKNOW (pop. 444,711) is one of the most ancient of India's great cities. It was the scene of a famous siege during the Sepoy Rebellion of 1857.

The city is situated on the Gumti River. Lucknow presents a striking appearance from a distance, with its minarets and gilded cupolas. For location, see India (color map).

Lucknow is noted for its silver, copper, and brass wares, embroidery, and cotton fabrics, as well as for the fine mangoes and cantaloupes which grow nearby.

Until the time of the Sepoy Rebellion, Lucknow was the capital of the independent state of Oudh. After the English recaptured the city, in 1858, it was made the capital of a district in the United Provinces of Agra and Oudh. When the United Provinces were changed to the state of Uttar Pradesh, Lucknow became the capital of the new state in India. Robert I. Crane

See also Sepoy Rebellion.

LUCRETIA, *lyoo KREE shih uh*, was a heroine of early Rome. According to legend she was the wife of Lucius Tarquinius Collatinus. Sextus, son of Tarquin the Proud, the seventh king of Rome, attacked her. She told her story to her husband, father, and cousin Brutus, and then killed herself with a dagger. The incident aroused the Romans to rebel against the king. The king and his sons were forced to leave Rome, and a new government was set up. Two consuls, one of them Brutus, headed the government. Thomas A. Brady

LUCRETIUS, *lyoo KREE shih us*, or *lyoo KREE shus* (94?-55 B.C.), a Roman philosophical poet, taught that death is complete extinction. He attempted to free men from the fear of gods and death. He based his six-volume poem, *De rerum natura (On the Nature of Things)* on the philosophy of Epicurus. This philosophy taught that the world is without divine design or rule. Lucretius explained his arguments with vivid word pictures which, he said, were like honey on the rim of a cup of bitter medicine. His work did not become popular until recent times. Lucretius was born in Rome. Moses Hadas

LUCY, SIR THOMAS. See Shakespeare, William (Marriage).

LUDENDORFF, *LOO dun dawrf,* **ERICH FRIEDRICH WILHELM VON** (1865-1937), a German general, served as chief of staff to Paul von Hindenburg during World War I. His assistance in organization and planning resulted, historians believe, in many German victories, including the defeat of the Russians at Tannenberg.

During World War I, Ludendorff rose from the rank of chief quartermaster of the Second Army to chief of staff of the entire German Army. After the collapse of the German Army in 1918, Ludendorff fled to Sweden. He returned in 1919 to enter politics, and aligned himself with the Nazis.

He took part in the unsuccessful "beer hall *putsch*," or revolution, organized by Adolf Hitler, in Munich in 1923. Ludendorff went to trial along with Hitler, but was freed because of his war record. Later, he broke with Hitler. He became a believer in a pagan religion which worshiped the old German god Wotan.

Ludendorff was born at Kruszewina, Germany, and received a military education. Gabriel A. Almond

LUDWIG, *LOOT vick,* or *LOOD vick,* **EMIL** (1881-1948), a Swiss biographer, won both fame and unfavorable criticism for his biographies. Such books as *Kaiser Wilhelm II* and *Jesus, The Son of Man* received bitter attacks, especially in Germany. Among his biographies are those of Bismarck, Napoleon, Lincoln, Beethoven, and Goethe. Other works include *The Nile* and *The Mediterranean.* Ludwig was born in Breslau, Germany, and studied at Heidelberg University. During World War II, he lived in the United States. G. F. Merkel

LUFFA, *LUHF uh,* is a vine gourd that comes from the tropics. One kind grown in the United States is called the *dishcloth* or *rag* gourd. The inside of the gourd consists of spongy fibers. When dried, these fibers can be used as sponges or dishcloths. The gourds are large and green. The vines have three to seven lobed leaves, and large yellow or white flowers.

Scientific Classification. The luffa is in the family *Cucurbitaceae.* It forms the genus *Luffa.* Harold Norman Moldenke

See also Gourd.

LUFTWAFFE, *LOOFT vah fuh,* has been the name of the German Air Force since 1935. The word means *air weapon* or *air arm.* Reich Marshal Hermann Goering commanded the Luftwaffe during World War II. He succeeded in making it a separate force with a status equal to that of the German army and navy. The Luftwaffe effectively supported German ground forces in Poland, Norway, France, Crete, and Russia. But it failed to win the critical Battle of Britain. See also Air Force (Famous Air Battles of History); Goering, Hermann Wilhelm. Mark M. Boatner III

LUGANO, LAKE. See Lake Lugano.

LUGWORM, or **LUGBAIT.** See Lobworm.

LUINI. See Fresco.

LUISETTI, "HANK," ANGELO. See Basketball (Great Basketball Players and Coaches).

LUKE, FRANK, JR. See Arizona (Famous Arizonans).

LUKE, SAINT, one of the authors of the New Testament, wrote the Third Gospel and the Acts of the Apostles in the Bible. These books give us the best picture we have of some of the events that took place during Luke's lifetime.

According to tradition, Luke was the "beloved physician" mentioned by Saint Paul. Bible scholars believe that Luke accompanied Paul on two of his missionary journeys, and that he kept a diary of their travels.

Luke was already a believer in Christ when he met Paul. He joined Paul at Troas and went with him to Macedonia. From that time on, Luke was Paul's close companion. Luke's knowledge of medicine may have been helpful to him. Luke was probably born at Antioch, in ancient Syria, of a non-Jewish family. He received a good education, studying great books as well as medicine. Frederick C. Grant

See also Acts of the Apostles; Gospels.

LUKEMAN, HENRY AUGUSTUS (1871-1935), an American sculptor, worked in a variety of forms. His statues include those of Senator J. Z. George of Georgia and Jefferson Davis, President of the Confederacy, in the U.S. Capitol. *Manu, the Law Giver* stands in the Appellate Court Building, New York City. Lukeman also did part of the work on the Stone Mountain *Confederate Memorial* in Georgia.

U&U

Henry Augustus Lukeman

He was born in Richmond, Va., and studied at the National Academy of Design in New York, and at the École des Beaux-Arts in Paris. Jean Lipman

See also Stone Mountain.

LULLABY is any quiet song used to calm babies. It is usually sung in a low, tender voice. One of the best-known lullabies is "Sweet and Low." See also Berceuse.

LULLY, *LYOO LEE,* **JEAN BAPTISTE** (1633?-1687), a French composer, developed the French or "Lullian" overture, which has served as a model for composers of opera and oratorio since that time. Lully brought to French music the tradition of florid Italian opera, and molded it to suit the French text. His use of the ballet was another of his contributions to music. Lully became a member of the orchestra at the court of Louis XIV, and later became the director of court music. He composed and produced 15 operas during the last 18 years of his life.

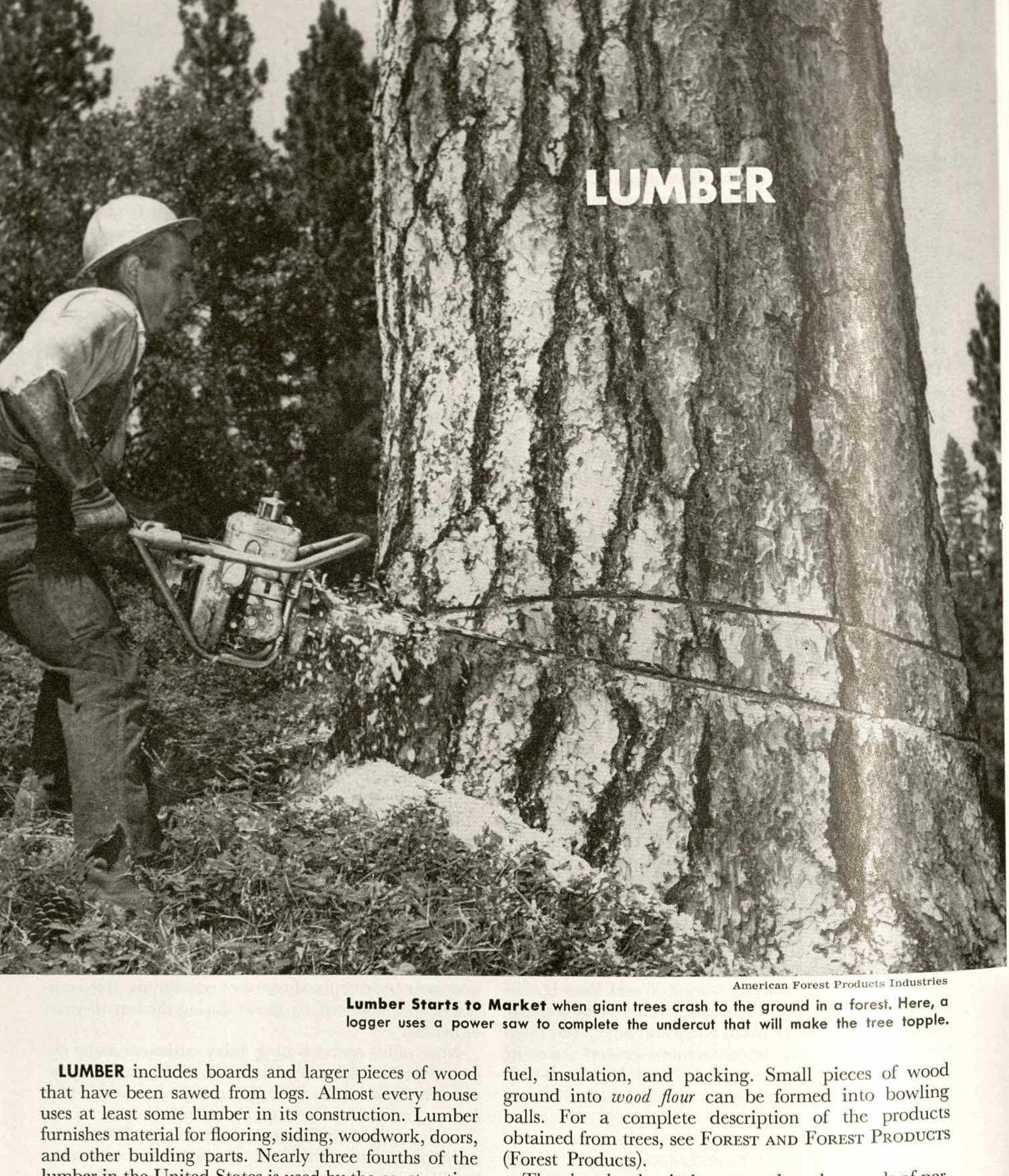
None of his operas is sung today, although many excerpts from them are still heard. They include the minuets from *Amadis, Proserpine,* and *Le Bourgeois Gentilhomme,* and the overtures to *Thésée* and *Alceste.*

Lully was born in Florence, Italy. He was brought as a child to Paris, where he studied ballet dancing, harpsichord, and violin. Warren S. Freeman

LUMBAGO, *lum BAY go,* is a backache in the *lumbar region,* or lower back. Infections, injury, clogging of waste in the intestines, floating kidneys, and the displacements of internal organs can cause lumbago. When lumbago occurs in the muscles, the patient's pain increases if he moves suddenly. Persons with lumbago often find relief by resting in bed, keeping warm, and using liniments or mustard plasters. Treatments with hot pads or infrared lamps sometimes help. When lumbago is severe and does not go away, the victim should be examined and treated by a physician. Joseph Lee Hollander

LUMBAR VERTEBRA. See Skeleton.

LUMBER



American Forest Products Industries

Lumber Starts to Market when giant trees crash to the ground in a forest. Here, a logger uses a power saw to complete the undercut that will make the tree topple.

LUMBER includes boards and larger pieces of wood that have been sawed from logs. Almost every house uses at least some lumber in its construction. Lumber furnishes material for flooring, siding, woodwork, doors, and other building parts. Nearly three fourths of the lumber in the United States is used by the construction industry. About one fourth of it goes from sawmills to factories that make boxes, crates, furniture, farm tools, toys, and hundreds of other products. The rest is made into railroad cars, railroad ties, ships, and boats.

If you visit a sawmill or watch a carpenter saw a piece of wood, you will see sawdust and small pieces of wood fall to the floor. These leftover bits of wood can be made into many valuable products. Often mills send both logs and wood scraps through a chipper. Pulp mills treat the chips with chemicals that change them into wood pulp. Manufacturers use pulp to make paper, plastics, rayon, and other products. Sawdust is used for fuel, insulation, and packing. Small pieces of wood ground into *wood flour* can be formed into bowling balls. For a complete description of the products obtained from trees, see FOREST AND FOREST PRODUCTS (Forest Products).

The giant lumber industry employs thousands of persons to cut down trees, transport logs to mills, saw logs into boards, and sell boards to manufacturers and to the public. The United States uses 43,000,000,000 board feet of lumber every year, more than any other country. The United States and Russia lead the world in lumber production, followed by Japan. Other important lumber-producing countries include Australia, Canada, Finland, Germany, and Sweden.

Kinds of Lumber

Lumbermen divide lumber into two main classes: *softwood* and *hardwood*. These classes are not based on the softness or hardness of the wood. They refer to the kind of tree from which the lumber came. Some softwood lumber is harder to cut or saw through than most hardwood. Also, lumber from certain hardwood trees is softer than lumber from most softwoods.

Lumber is also classed by its condition. *Rough lumber* has straight sides and edges, but is rough and splintery. *Dressed lumber* comes in smooth, evenly cut boards. *Worked lumber* is dressed lumber that has notches at the sides so boards fit together to form a good joint.

Softwood Lumber comes from trees called *conifers*, whose seeds grow in cones (see Cone-Bearing Trees). Common conifers include pine and fir. These trees have thin, waxy, needle-shaped leaves. They are also called *evergreens*, because they usually keep their needles the year around. Douglas fir, hemlock, redwood, spruce, and cedar produce most softwood lumber. Their wood is used for boxes, doors, frames, panels, and other building materials.

LUMBER TERMS

Board Foot is a piece of lumber 1 foot long, 1 foot wide, and 1 inch thick.

Flooring is lumber used in floors. It is usually hardwood, 1 inch thick and 2 to 4 inches wide.

Landing is a central place in the forest where logs are brought before being taken to a sawmill.

Log Rule is a table that shows about how much lumber can be sawed from logs of different sizes.

Lumberjack, or Logger, is a worker who cuts down trees in a forest, saws them into logs, and brings them to the mill.

Millwork is building material made of finished wood in millwork plants or planing mills. It refers to such items as doors, blinds, frames, cornices, columns, mantels, and panelwork.

Paneling is lumber made into panels, especially for the insides of buildings.

Plank is a piece of lumber 2 to 4 inches thick and 8 or more inches wide.

Plywood is a panel made of thin layers of wood glued together under heavy pressure.

Sawmill is a plant that saws logs into lumber.

Sawtimber means trees large enough to be cut for lumber.

Siding is lumber used to cover the outsides of buildings.

Skid Road is a road or trail leading from a cutting area to the skidway or landing.

Skidding means hauling or dragging logs from the cutting area to the landing.

Slabs are the outside pieces of a log removed in sawing lumber.

Stumpage is timber that stands uncut in a forest.

Softwood lumber can be classified according to its use. Carpenters use *yard lumber* to build houses. *Structural lumber* can stand heavy strain. It is larger than yard lumber, and is used for posts, planks, and beams. Sawmills usually sell *factory and shop lumber* directly to factories for making boxes, toys, and other products.

Hardwood Lumber is sawed from broad-leaved trees. These trees are usually *deciduous*, which means they lose their leaves in autumn (see Deciduous Tree). Hardwoods used for lumber include oak, maple, yellow poplar, sweet gum, birch, tupelo, cottonwood, aspen, and beech. Tropical hardwoods include mahogany, ebony, teak, and rosewood. Many hardwoods produce beautiful lumber that makes fine furniture. This wood is also used for paneling, flooring, baseball bats, tool handles, and many other items.

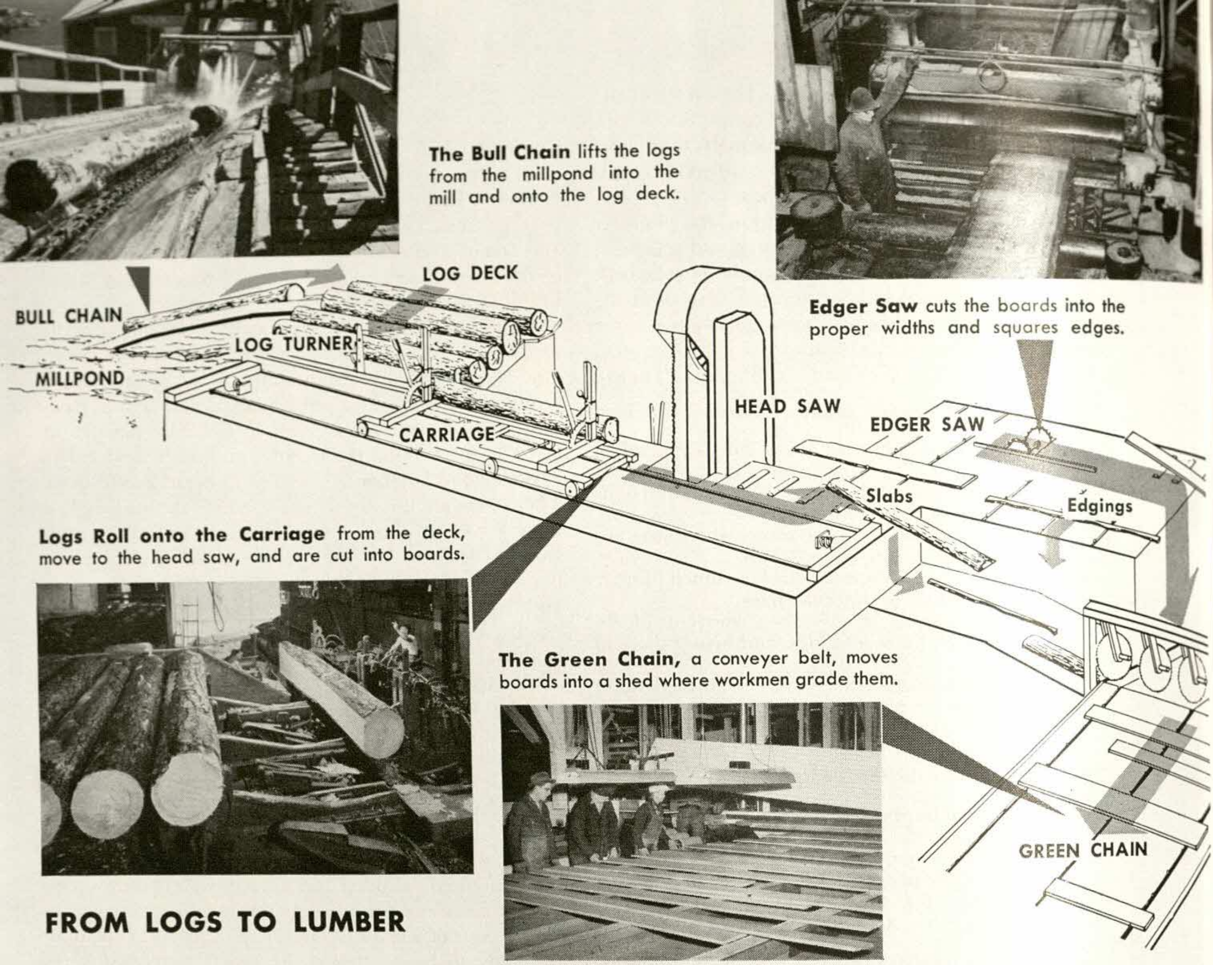
Much hardwood lumber is sawed into small pieces called *hardwood dimension lumber*. This cuts out defects and provides greater usefulness. Manufacturers use it to make chair arms, piano legs, and other furniture parts. When furniture or tool factories want plain blocks of hardwood, they order *rough hardwood dimension*. If they need trimmed, molded, or sanded wood, they order *surfaced hardwood dimension*. If the manufacturer wants to buy parts of a chair, such as legs, arms, or seats, that are ready to be assembled, he orders *completely fabricated hardwood dimension*.

From Forest to Sawmill

Since the early days of colonial life in North America, lumbering has been an important and exciting industry. Forests echoed with the long-drawn warning cry of

Edward Hines Lumber Co.; American Forest Products Industries

From Forest to Sawmill. Trucks, *above*, or railroad flatcars usually carry logs from the forest to the sawmill. At the mill, the logs are dumped into a log pond, *right*, to await cutting into lumber. Boom men wearing spiked shoes walk on the logs to sort them.



The Bull Chain lifts the logs from the millpond into the mill and onto the log deck.

Edger Saw cuts the boards into the proper widths and squares edges.

Logs Roll onto the Carriage from the deck, move to the head saw, and are cut into boards.

The Green Chain, a conveyer belt, moves boards into a shed where workmen grade them.

FROM LOGS TO LUMBER

“Timbe..e..err” as great trees came crashing to earth. *Lumberjacks,* who cut down trees and delivered logs to the mills, became famous as strong, hearty, courageous men. Many legends sprang up about their exploits as they cleared forests and took logs to the mill by ox team, by raft, or by guiding them down rushing streams after spring thaws. Some of the stories about early lumbermen are true. Others, such as the tales of the legendary giant Paul Bunyan, are humorous exaggerations (see Bunyan, Paul).

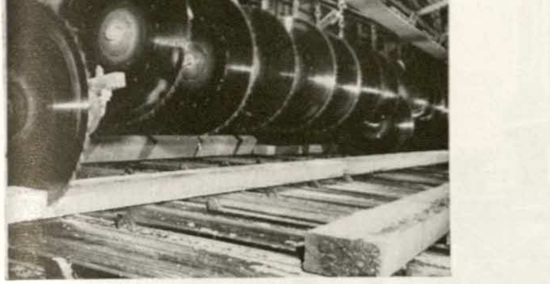
The present-day lumberjack, or logger, is a man of strength and courage, highly skilled in his work. Up-to-date, large-scale lumbering operations require special mechanical equipment and technical knowledge. If you could spend a day with a logging crew, you would find that they lead a different kind of life from that of lumbermen before the 1900's. Many lumbermen leave their homes in the morning and drive to work as other men do. Others ride into the woods in company trucks or trains. They live in a logging camp only if the logging area lies in a hard-to-reach place, such as high on a mountain.

The Logging Camp of today is not like the camps of earlier times. Then men lived in large bunkhouses with few comforts. They spent most of their time working or sleeping. Today, a logger may live in his own home with his family, or in a dormitory with other men. Workers who live in the bunkhouse eat in a large cookhouse. The camp may have a school and a store, and usually has a church and recreation center. Life in the logging camp today resembles life in any small community, except that no busy highways pass it and no towns are nearby.

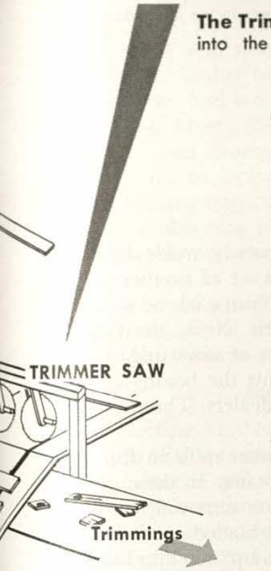
Cutting Down Trees. Before the loggers go into the woods, a *forester* indicates which trees they should cut. The forester is a scientist trained in growing crops of trees so that they will yield the greatest possible amount of lumber. He also knows how to protect forests from fire, insects, disease, and grazing animals.

Men called *fallers* come to work carrying their own power saws. They *fell,* or cut down, trees that the forester has marked for cutting. The power saw that the fallers use may weigh as much as 40 pounds. With its small gasoline motor and whirling chain saw, it can slice through a tree trunk in a few seconds. The old-fashioned two-man crosscut saw, or “misery whip,” took about three times as long and required back-breaking work. See Saw.

In felling a tree, the faller first makes an *undercut.* He cuts a wedge-shaped piece out of the tree trunk with an ax or power saw. The faller makes the undercut on the side of the tree that he wants to fall toward the ground. He makes the cut close to the ground to avoid wasting valuable wood by leaving a high stump. After the saw has cut through the tree trunk, the undercut makes the tree lose its balance and fall toward that side. Expert fallers can drop a tree exactly where they want it. They can avoid striking other trees, or hitting stumps that



The Trimmer Saws cut the boards into the various lengths desired.



Seasoning, or Drying, Lumber may be done in stacks in the yard or in heated buildings called *dry kilns.*

Diagram and photographs courtesy of American Forest Products Industries

might break or damage the trunk of the falling tree.

Some tree trunks weigh several tons, and may measure 200 feet or more in length. Men called *buckers* cut the trunks into shorter lengths, so they can take the wood out of the forest more easily. Buckers use axes or power saws to lop off the limbs. Then they saw the trunks into logs from 12 to 40 feet long.

Transporting Logs from the woods to the sawmill is the second step in logging. It consists of two operations. First, the lumbermen *skid,* or drag or haul, the logs to the *landing,* a central place in the woods. Then they transport the logs from the landing to the sawmill.

Workers use horses, tractors, or long cables called *draglines* to skid the logs to the landing. Usually, the logs are hauled over the ground. But sometimes workers transport them in special carriers. In the Northern Forest, for example, lumbermen use big sleds to carry logs over icy roads in winter. The kind of power used to skid logs depends on the size of the logs, the steepness of the forest land, and the climate.

High-lead (pronounced *leed*) logging is the best method to drag logs up steep slopes or to swing them across ravines. This method uses a system of pulleys and steel cables powered by giant diesel, steam, or electric winches. A brave, skilled worker called a *high-climber* climbs to the tops of one or two tall trees called *spar trees.* The high-climber saws off the tops of the trees between 150 and 180 feet above the ground and attaches the pulleys. The cables run from rotating drums on the winches, over the pulleys, to the logs. As the drums turn, they haul in the cables and pull the logs to the landing. High-lead logging can bring logs from as far as a half mile away into a landing. The logs are piled at the

LEADING LUMBER PRODUCING STATES AND PROVINCES

Oregon	8,198,150,000 bd. ft.
California	5,216,650,000 bd. ft.
British Columbia	4,614,250,000 bd. ft.
Washington	3,241,550,000 bd. ft.
North Carolina	1,560,100,000 bd. ft.
Georgia	1,438,900,000 bd. ft.
Idaho	1,418,050,000 bd. ft.
Alabama	1,249,150,000 bd. ft.
Virginia	1,163,850,000 bd. ft.
Arkansas	1,058,550,000 bd. ft.

Each symbol stands for 2,500,000,000 board feet of lumber produced each year.
Based on official government statistics.

LEADING LUMBER PRODUCING COUNTRIES

Russia	37,209,000,000 bd. ft.
United States	35,235,000,000 bd. ft.
Japan	9,639,000,000 bd. ft.
Canada	7,550,000,000 bd. ft.
Sweden	3,233,000,000 bd. ft.
France	3,117,000,000 bd. ft.
Germany (West)	3,068,000,000 bd. ft.
Poland	2,879,000,000 bd. ft.
Finland	1,939,000,000 bd. ft.
Czechoslovakia	1,825,000,000 bd. ft.

Each symbol stands for 2,500,000,000 board feet of lumber produced each year.
Based on a 4-year average of government statistics.

Finished Lumber goes to lumberyards on powerful trucks. At the lumberyard, small lift trucks unload the boards and pile them in stacks to await delivery to the final consumers.

International Harvester

landing until they can be moved to the mill.

If the landing lies near a road, trucks carry the logs to the mill. If it is on a railroad line, men load the logs onto flat cars for the trip. If the landing is on the bank of a stream or river, workers use chains to bind the logs into rafts that float to the mill. Sometimes barges carry logs. Trucks transport the largest number of logs.

From Sawmill to Lumberyard

The United States has about 50,000 sawmills. Most lumber comes from small sawmills, each of which produces less than 10,000,000 board feet of lumber a year. Some mills are so small that the *headrig*, or sawing machinery, can be loaded on a truck trailer and hauled into the woods.

If you visited a fairly large sawmill, you would probably see a big building beside a pool of water. This pool is the *log pond*, in which the logs are kept until they go into the mill. The water protects them from insects, fungi, stain, and fire. Large trucks carrying logs arrive at the mill. The truck drivers stop beside the pool and dump their loads of logs into it. *Boom men* wearing spiked boots walk about on the wet logs in the pond. They use long poles to sort the logs. They make sure that all the logs of one kind or size go into the mill together. Hardwood mills usually store their logs on dry land, because some heavy hardwood logs sink in water.

Sawing Logs. A moving conveyer belt carries the logs up a wooden chute into the mill. Jets of water forced through overhead pipes give the logs a stinging bath. By the time the logs enter the mill, no sand, dirt, or small bits of metal remain on them that might dull the sharp saw blade.

In some mills, a *log debarker* removes the bark before the log reaches the first saw, called a *headsaw*. One kind of debarker consists of rough metal bars or knives that rub off or chip off the bark. Another type tears off the bark by the force of water shot onto the log under great pressure.

As a log enters the sawmill, machinery moves it onto a platform called a *carriage*. The carriage looks somewhat like a small railroad flatcar. It carries the logs into the teeth of the headsaw. The saw screams as it tears into the wood. Each time the carriage goes past the saw, the saw slices off a board until the log has become a pile of boards.

Moving belts then carry the newly made boards, called *green lumber*, to the *edger*, a set of smaller saws. These saws trim the rough edges from each board and make the sides straight and even. Next, the edged boards go to the *trimmer*. This set of saws makes the ends of the boards square, and cuts the boards to the exact lengths ordered by lumber dealers. The trimmer also cuts off weak or bad spots.

Gang saws are used in most lumber mills in Europe and in some mills in the United States. In these mills, after the outer slabs of the logs are removed, the log moves into a set of several straight-bladed saws. These saws are spaced to cut the "squared-up" log into boards of the desired thickness in one operation.

Grading Lumber. The green boards, now called *rough lumber*, ride slowly on the *green chain*, a moving belt. Men called *graders* walk along the green chain, examining each board carefully and deciding its grade. They sort the boards according to size, quality, and kind of wood. Each man carries two long sticks. One stick has a hook, which the grader uses to flip boards over. The other stick has a crayon on the end, with which the grader marks the grade on each board.

The eight grades used by the National Hardwood Lumber Association to classify hardwood are, from highest to lowest: (1) *firsts*, (2) *seconds*, (3) *selects*, (4) *No. 1 common*, (5) *No. 2 common*, (6) *sound wormy*, (7) *No. 3A common*, and (8) *No. 3B common*. Softwood lumber associations use various grades for their lumber. Yard lumber grades include *finish*, in grades A through D; *common boards*, numbered 1 through 5; and *common dimensions*, numbered 1, 2, or 3. Structural lumber, factory lumber, and shop lumber are classified by use and then are graded.

Seasoning Lumber means removing excess moisture from the wood. More than half the weight of green lumber may come from moisture in the wood. After seasoning, less than a tenth of the weight of the lumber is due to moisture. Mills sometimes ship lumber without seasoning. But for most uses the moisture must be removed so the wood will not warp. In the process, the wood shrinks in size.

Lumbermen sometimes season lumber by *air drying*. They stack the wood outdoors to let the sun and wind dry it. A quicker way of seasoning lumber is to put green lumber in *dry kilns*, or special heated buildings in which instruments control the temperature and moisture of the air. The instruments tell how much moisture remains in the wood. Sometimes mills dry lumber by both methods.

Planing. Some rough lumber is used in construction. It is shipped to wholesale dealers or lumberyards throughout the United States or in other countries. But the rest of the lumber must pass through a *planing mill* before it goes to market. This mill may be near the sawmill or in another city. In a planing mill, lumber passes through machines that have sharp knife blades in them. These knives shave and smooth the rough boards. Lumber also receives further treatment to make it into dressed lumber or worked lumber.

Shipping. Most mills ship lumber to wholesale dealers in the United States. The wholesalers sell to retail lumberyards, to factories that make wooden articles, and to construction companies. From forest to mill to retailer, lumber may travel by truck, by rail, or by ship. Most long-distance hauling is by rail. But ships bring large amounts of lumber from the West through the Panama Canal to markets on the East Coast. Trucks make most of the short lumber-carrying trips in all parts of the country.

Buying Lumber

In selecting lumber, you should keep in mind the work you wish it to do or the effect you want to achieve. When strength and durability are important, choose grades free from knots, checks, and pockets of pitch. But for decorative use, knots make interesting designs. The strength of structural lumber, for the great wooden arches in the ceiling of a church or the heavy flooring of a factory, can be measured to predict the weight it can carry. Douglas fir and pine rank as the most important kinds of wood for home building. But oak and maple are popular for flooring, and redwood makes fine siding.

The width and thickness of lumber is always given in inches, and the length in feet. For example, a 2 by 4 by 12 board is a piece of lumber 2 inches thick, 4 inches wide, and 12 feet long. Thicknesses are often expressed in quarter-inch units. A board $1\frac{1}{4}$ inches thick is called *five-quarter* lumber. Lumber is measured before it is seasoned and planed, so the finished boards are actually smaller than the dimensions. For example, 4-inch boards really measure from $3\frac{1}{4}$ to $3\frac{5}{8}$ inches wide.

In the United States and Canada, lumber prices usually refer to 1,000 board feet. Lumber priced at $150 for 1,000 board feet would sell at 15 cents a board foot.

History

For thousands of years, forests have contributed to the progress of mankind. Primitive men built homes out of branches or logs. They used wood as handles for their tools and weapons. Cross sections cut from logs served as crude wheels for early carts. Logs fastened together formed rafts for transportation. Wood used as fuel for fires provided warmth and a means of cooking.

The pioneers who opened the North American wilderness began to clear vast forests. Lumbering was the first industry in the colonies. The colonists traded with Europe, sending sassafras bark, white pine logs, clapboards, wainscoting, and naval stores (see NAVAL STORES).

Plenty of raw material was available in those days. Heavy, dark forests covered the entire eastern half of what is now the United States, and most of Canada. Trees had to be cut down to make way for roads and farms.

The first boards manufactured in the colonies were sawed over pits. One man stood beneath and another above the log, at the ends of a two-man saw. Sawmills probably first appeared in the United States in Maine and Virginia between 1608 and 1620. The earliest sawmills were crude, water-powered mills. Steam power replaced water power in the mills about 1830.

In the 1860's, the lumber industry centered in Pennsylvania. As settlers cut down forests and cleared land, the industry gradually moved toward the West and South. By 1870, it had moved into Michigan. By 1909, the pine forests of the South led in lumber production. Since 1920, the center of the lumber industry has been in the Pacific Northwest, with the South running a close second.

The lumber industry in Canada became important during the 1800's. Canada exported timber to Great Britain, and to the United States after the mid-1800's. Most of the lumber in the early 1800's came from eastern Canada. By 1900, British Columbia had become an important source. In the 1950's, British Columbia produced more than half of Canada's lumber.

Today, as in the past, houses, furniture, ships, and many other necessary items are made of wood. Some products of colonial times have been replaced, including Conestoga wagons and covered bridges. But wood is even more essential today than in colonial times. Scientists have developed many important new products made from wood, including cellophane, plastics, and rayon.

ALMA DEANE MACCONOMY

Related Articles in WORLD BOOK include:

Carpentry
Colonial Life in America
  (Lumbering and Shipbuilding)
Forest and Forest Products
House
Plywood
Rot
Tree
Veneer
Wood
Woodworking
Woodworking Tool

Outline

- **I. Kinds of Lumber**
  - A. Softwood Lumber
  - B. Hardwood Lumber
- **II. From Forest to Sawmill**
  - A. The Logging Camp
  - B. Cutting Down Trees
  - C. Transporting Logs
- **III. From Sawmill to Lumberyard**
  - A. Sawing Logs
  - B. Grading Lumber
  - C. Seasoning Lumber
  - D. Planing
  - E. Shipping
- **IV. Buying Lumber**
- **V. History**

Questions

What is the most important use of lumber?
How do fallers aim a tree?
What is high-lead logging?
What do boom men do?
Why must logs be washed before they are sawed?
How may lumber be seasoned?
How was lumber sawed in colonial times?
What is a *board foot?*
What is the difference between softwood and hardwood?
What two kinds of wood are the most important in home building?

LUMEN. See Candle Power; Light (Measuring Light).

LUMIÈRE, *luh MYEHR,* is the family name of two French scientists who were brothers. **Auguste** (1862-1954) and **Louis Jean** (1864-1948) became known for their work in photochemistry. In 1895 they invented the *cinematographe,* a combination motion-picture camera, printer, and projector. Some of the first motion pictures were produced and shown to audiences with this apparatus (see Motion Picture [The First Motion Pictures]). In 1907 the Lumière brothers invented the *autochrome plate,* the first popular direct-color photographic process.

The Lumière brothers were born in Besançon, France. Beaumont Newhall

LUMINOUS COLOR. See Color (Other Ways Color Is Produced).

LUMINESCENCE, *LYOO muh NEHS uhns,* is the emission of light by means other than heat. For example, fireflies give off a visible glow often called *cold light.* Certain substances glow at low temperatures when exposed to cathode rays or X rays. Thus, nonluminous radiation, such as X rays, can produce luminous radiation.

Luminescence that continues only as long as the radiation is applied is called *fluorescence.* In a fluorescent lamp, invisible ultraviolet rays bombard a phosphor coating to produce light.

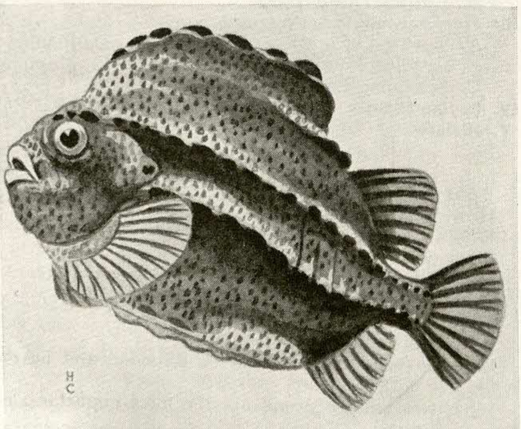
Luminescence that lasts after the radiation is removed is called *phosphorescence.* Many minerals are phosphorescent. The light given off by fireflies and certain fungi is called *bioluminescence.* Clarence E. Bennett

See also Bioluminescence; Fluorescence; Phosphorescence.

LUMPFISH, or **LUMPSUCKER,** is a fish that lives near the shore in the cold ocean waters of the north. Its body and head are thick and short. Its back is arched. The lumpfish has a sucking disk that enables it to cling to rocks. Lumpfishes have no commercial use. In Great Britain, they are also known as *cockpaddles.*

Scientific Classification. The lumpfish is in the family *Cyclopteridae.* The North Atlantic lumpfish is genus *Cyclopterus,* species *lumpus.* The lumpfish in Puget Sound is *Lethotremus vinolentus.* Leonard P. Schultz

The Bulky Shape of the Lumpfish Gives It Its Name.



LUMPY JAW is a disease that attacks the jaws of cattle and hogs. It is also called *actinomycosis.* It sometimes occurs in other animals and in man, and may attack various parts of the body. Lumpy jaw is caused by a microorganism called *Actinomyces bovis,* which belongs to a group of imperfect fungi. Lumpy jaw cannot spread from one animal to another. The organism is carried in forage and enters the animal's skin through a cut or break. It penetrates and destroys tissue, often down to the bones. Pus forms, and fibrous tissue grows over the area. Lumpy jaw may injure the general health of an animal by infecting important organs close to the jaw. When the tongue is infected, the disease may be called *wooden tongue.* J. F. A. McManus

LUMUMBA, PATRICE. See Congo (History).

LUNA is the Latin name for the moon. The Greeks and later the Romans believed that the moon was a goddess. They often identified her with Diana (Artemis), the sister of Apollo, the sun-god. Luna was associated with recurrent diseases, and it was sometimes believed that she would drive people insane if they offended her. The word *lunatic,* meaning *moonstruck,* comes from her name. See also Apollo; Diana; Monday. Philip W. Harsh

LUNAR CAUSTIC. See Silver Nitrate.

LUNAR ECLIPSE. See Eclipse.

LUNCH, SCHOOL. See School Lunch.

LUNCHROOM. See Restaurant.

LUNDY, BENJAMIN (1789-1839), an American abolitionist and editor, prepared the way for the national antislavery movement. In 1815, Lundy organized the Abolitionist Union Humane Society, in St. Clairsville, Ohio. He organized other antislavery groups, and published *The Genius of Universal Emancipation,* the *National Enquirer,* and other periodicals. Lundy lectured and traveled widely, seeking places for free Negroes. He was born in Sussex County, N.J. See also Garrison, William Lloyd. Louis Filler

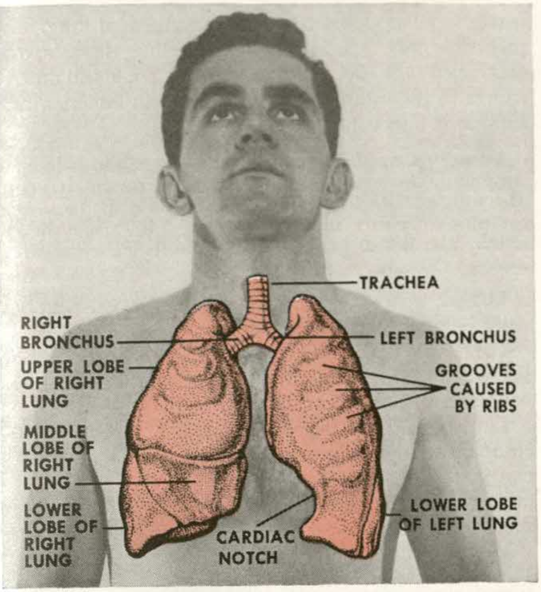
LUNDY'S LANE, BATTLE OF. See War of 1812 (Campaigns of 1814; map).

LUNÉVILLE, TREATY OF. See Napoleon I (Wars Against Austria).

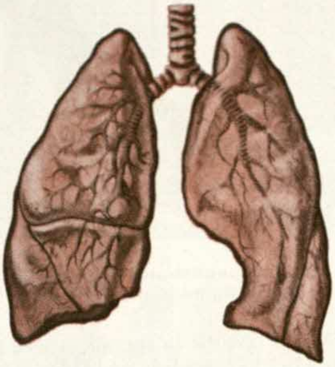
LUNG is an organ of external respiration, or *breathing,* present in human beings and in many animals. It is necessary to maintain life and acts as an exchange point where oxygen from the air is substituted for waste gases from the body. Simple plants and animals that live in water do not need lungs. All their cells are in constant contact with the water, and it takes up their waste gases and supplies their oxygen. But man and higher forms of animals have complex bodies made up of many cells that depend completely on their lungs for respiration. Man's lungs are large and quite complex. If the walls of the air sacs alone could be spread out flat and placed side by side, they would cover an area of 2,600 square feet, or more floor space than the average house.

Human Lungs

Human beings have two lungs. These are large, pyramid-shaped organs made up of masses of spongy tissue and suspended in the chest cavity. The lungs extend upward behind the collarbone. They rest on the powerful, muscular diaphragm that separates the chest and abdominal cavities. Between the lungs are the esophagus, the heart, and the large blood vessels.



The Lungs are located beneath the ribs in the chest cavity. The heart lies between the two lungs in the cardiac notch.



The Bronchi, or Bronchial Tubes, branch off the *trachea* (windpipe) and enter the lungs, where they split into smaller tubes.

The Pleura is a continuous, thin, elastic membrane that covers the outside of the lungs, the inside chest wall, and the diaphragm to form membranous sacs called the pleural cavities. Normally there is no actual space between the portion of the pleura that covers the lungs and that that covers the chest wall. They are in constant contact. But in certain diseases, blood, fluid, or air may collect between the layers of the pleura, creating a cavity.

The Air Passages. Air enters the body through the air passages: the nose, pharynx, larynx, trachea, bronchi, and bronchioles. These form a continuous passageway. But at the point where the trachea enters the chest cavity, it divides into a right and left *bronchus*, or *bronchial tube*. Each bronchus enters a lung about midway between the top and bottom. Within the lung, the bronchi divide into smaller and smaller tubes, much as a tree limb divides into branches and twigs. Finally, the bronchi form countless tiny tubes called *bronchioles*. The smallest of these open into tiny cup-shaped hollows known as *air sacs*, or *alveoli*. Scientists have estimated that there are more than 600,000,000 of these in the lungs. Each alveolus contains a meshlike network of tiny blood cells called *capillaries*.

The Lobes. The alveoli form clusters like bunches of grapes around the bronchioles. These clusters are called *lobules*. They unite to form larger groups called *lobes*. Two lobes make up the left lung, and three the right.

Characteristics. The bronchial tubes, together with the blood vessels, lymph vessels, and nerves of the lungs, are bound together by elastic tissue. The lungs themselves are quite elastic. They stretch like balloons or rubber bags when filled with air. Because they are made up of a countless number of air cells, they weigh very little. In proportion to their size, they are the lightest organs in the human body. A man's lungs weigh about 3½ pounds and a woman's about 2¾ pounds. A baby's lungs are pinkish. The lungs of an adult are slate-colored and mottled in appearance.

The Work of the Lungs

The lungs supply the body cells with oxygen. As the blood circulates through the body, carrying nourishment to the tissues, it gives up oxygen and absorbs carbon dioxide. It then returns to the lungs for more oxygen. Every time a person takes in a breath, fresh air containing oxygen enters the lungs. The oxygen seeps through the thin walls of the air sacs and is absorbed by the blood. See Respiration.

Diseases and Care of the Lungs

The most dangerous diseases of the lungs are pneumonia and tuberculosis. Both are caused by germ infections. *Pneumonia* is inflammation of the air cells. Inflammation of the bronchial tubes is *bronchitis*. *Pleurisy* is inflammation of the pleura.

To maintain good health, it is necessary to breathe fresh, clean air. It is also important that the lungs have room to expand and contract. A person should not wear clothes that restrict the movements of the ribs and abdomen. Many tobacco smokers *inhale*, or draw smoke into the lungs. Inhalation may irritate and inflame the lining of the air passages and weaken the tissues. Some scientists believe that cigarette smoke may cause cancer of the lungs (see Cancer).

Andrew Conway Ivy

Related Articles. See the Trans-Vision three-dimensional color picture with Human Body. See also the following articles:

Body Structures

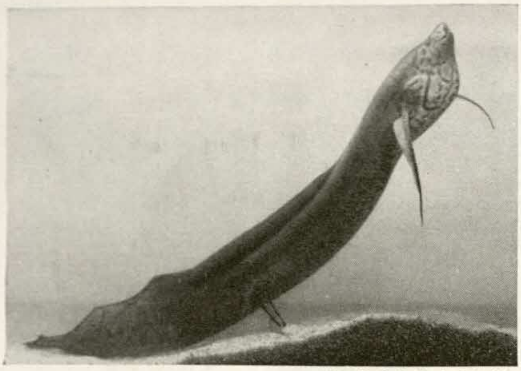
Chest
Diaphragm
Larynx
Nose
Pharynx
Pleura
Windpipe

Diseases

Bronchitis
Pleurisy
Pneumonia
Silicosis
Tuberculosis

Unclassified

Asphyxiation
Drowning
Iron Lung
Pneumothorax



New York Zoological Society

The Curious African Lungfish uses an air bladder to breathe, and lives in a cocoon during the long dry season.

LUNGFISH can breathe in the air as well as in the water. It has gills like other fish, and also an air bladder which it uses like a lung. See Gill; Lung.

Lungfishes live in Australia, Africa, and South America. The African and South American kinds have long pectoral and pelvic fins that look like round whips. The Australian lungfish has paired fins that look like paddles. The skeleton is made entirely of cartilage, and the teeth form large plates.

The lungfish can live in polluted water, because it can breathe air at the surface. Fishes that depend on the oxygen in the water would die in such water. The lungfish can also live through dry periods. When the dry season arrives, the fish builds a mud shell around itself. This shell is called a *cocoon*. The lungfish stays inside its cocoon until the next rainy season. It lines the inside with mucus from its body, and lives on fat stored in its own organs. This condition is called *estivation*.

The cocoons can easily be collected and shipped. When they are placed in tepid water, the mud softens, and the fish emerge.

The lungfishes hold an important place among fishes. Scientists who study them find clues to show that the fishes and four-footed land vertebrates are relatives. Lungfishes belong to the subclass *Choanichthyes*. Scientists believe that the ancestors of all amphibians and land vertebrates belonged to this same group.

In Australia and South Africa, many people have used lungfishes for food.

Scientific Classification. Lungfishes belong to the bony fishes, class *Osteichthyes*. They make up the superorder *Dipnoi* (Dipneusti). The family *Lepidosirenidae* includes the African lungfish, genus *Protopterus*, species *annectans*, and the South American lungfish, *Lepidosiren paradoxa*. The Australian lungfish, *Neoceratodus forsteri*, belongs to the family *Ceratodonitidae*. Carl L. Hubbs

See also Life (table, Length of Life of Animals).

LUNGWORT, *LUNG wurt*, is the name of several perennial plants of the borage family. The most common is also called *Virginia cowslip* and *Virginia bluebell*. It grows from southern Canada to South Carolina, and west to Kansas. Farther west, the *lanceleaf* lungwort replaces it. These plants have smooth stems and large leaves. The bell-shaped flowers appear pink at first, but turn blue. Lungwort can grow from seed in gardens.

Another plant of the same name grows in Europe. It has small blue flowers and white-spotted leaves. These leaves were supposed to resemble a diseased lung. The plant was once a popular remedy for lung diseases, and was called *lungwort*. An olive-green lichen found on tree trunks in mountainous regions of North America and Europe is also called lungwort.

Scientific Classification. The lungwort plants belong to the family *Boraginaceae*. The Virginia cowslip is genus *Mertensia*, species *virginica;* the lanceleaf is *M. lanceolata;* the blue lungwort, or Jerusalem sage, is *Pulmonaria officinalis*. The lichen belongs to the family *Parmeliaceae*. It is *Stica pulmonaria*. Earl L. Core

LUNIK, space probes. See Space Travel (Probes; color picture, Striking the Moon).

LUNT, ALFRED (1893-   ), an American actor, and his wife, Lynn Fontanne, became the most famous couple in the American theater. See Fontanne, Lynn.

Lunt began his stage career with a Boston theater company, and toured with Margaret Anglin, an American star. Lunt's first real fame came in 1919 as the star in *Clarence*.

In 1924, Lunt and his wife joined the Theatre Guild. They starred together for the first time in the *Guardsman*. Other successes include *Reunion in Vienna*, *The Taming of the Shrew*, *Idiot's Delight*, *Amphitryon 38*, and *I Know My Love*. In England, the Lunts played in *There Shall Be No Night*, *Love in Idleness*, and other plays. Lunt and his wife won fame for the brilliance of their acting and for their perfect technique. They toured Europe during World War II to perform before Allied troops. Lunt starred alone in *Marco's Millions* and *Volpone*. He was born in Milwaukee, Wis., and attended Carroll College and Harvard. Mary Virginia Heinlein

Vandamm

Alfred Lunt

LUNULE, or **LUNULA,** in physiology. See Nail.

LUPERCALIA, *LYOO per KAY lih uh*, was an ancient Roman festival. It was celebrated on February 15 in honor of Faunus, a rural Italian god. Faunus was later identified with Pan, the god of herds and fertility. The rites centered at the Lupercal, a cave in the Palatine Hill. Priests sacrificed goats and cut their skins into strips for lashes. Then they ran around the Palatine Hill, striking at all the women they met. The ceremonies also involved purification through the sacrifice of a dog. They were often mentioned in literature. See also Valentine's Day. Thomas A. Brady

LUPINE, *LYOO pin*, is the name of a group of plants in the pea family. Lupines have wandlike clusters of showy blue, yellow, white, or red flowers that resemble sweet peas. The leaves have several narrow leaflets, all attached at the same point. About a hundred kinds of lupines grow in North America. Some contain poisonous alkaloids, but the seeds of others can be eaten.

Scientific Classification. The lupines are classified as members of the pea family, *Leguminosae*. They make up the genus *Lupinus*. Arthur Cronquist

See also Bluebonnet; Flower (Flowers of Roadside, Field, and Prairie).

LUPULIN. See Hop.

LUPUS, *LYOO puhs,* is tuberculosis of the skin. It usually attacks the skin of the cheeks close to the nose. Several hard brownish-red pimples appear. They range in size from a pinhead to a pea. These pimples gradually change into sores, or ulcers, that leave bad scars. The patient should be examined for tuberculosis in other parts of the body, and treatment given by a physician. Sunlight has been helpful in some cases. See also TUBERCULOSIS. LEON H. WARREN

LURAY, *lyoo RAY,* **CAVERNS** are a group of underground caves near the town of Luray, Va. The caverns lie in a limestone belt of the Shenandoah Valley on the west side of the Blue Ridge Mountains. The caves have hundreds of large rooms. Some of them are more than 260 feet high. Some of the many-colored hanging rocks, called stalactites, are over 50 feet long. The caverns were discovered by Andrew J. Campbell and his companions in August, 1878. ELDRED D. WILSON

See also STALACTITE.

LURE FISHING. See FISHING; FISHING INDUSTRY (Chief Fishing Methods).

LUSAKA, *loo SAH kuh* (pop. 52,500; met. area, 59,500), is the capital of northern Rhodesia. For location, see RHODESIA AND NYASALAND, FEDERATION OF (map). The capital was moved from Livingstone to Lusaka in 1935. Lusaka is a planned community that lies about 4,200 feet above sea level. It has a pleasant climate.

Lusaka is an important communications and trade center. It lies near the midpoint of the country's only railroad, and at the junction of two main roads. Lusaka also has an international airport. H. V. B. KLINE, JR.

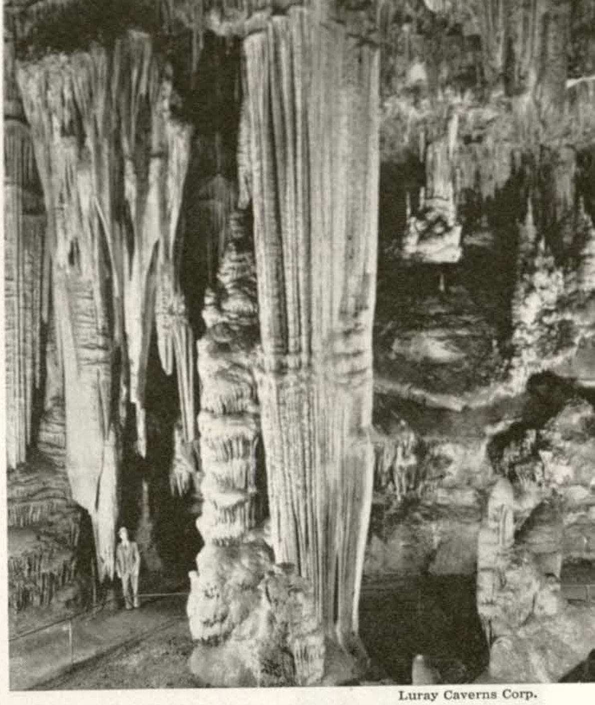
LUSITANIA, a passenger ship of the Cunard Line, sank off the coast of Ireland on May 7, 1915, after it was torpedoed by a German submarine. Of the 1,924 persons aboard the *Lusitania,* 1,198 lost their lives, including 128 Americans. The sinking aroused great anger in the United States, and contributed to the entry of the United States into World War I. See also WORLD WAR I (Action on the High Seas). HUGH M. COLE

LUSITANO-AMERICAN, *LOO sih TAY noh.* The Brazilian people of Portuguese descent are sometimes called Lusitano-Americans, just as the people of Portugal are sometimes called Lusitanians. Lusitania was a country in western Hispania, an ancient territory that included present-day Spain and Portugal. See also PORTUGAL (Early Years).

LUSSE TUNNEL carries trains 4.26 miles through the Vosges Mountains of northeastern France. It stretches between the towns of Sélestat and St. Dié. Work began on the tunnel in 1933, but was not completed until 1937. Engineers had to bore through two miles of solid granite.

LUTE is an ancient musical instrument which was most popular in the 1500's and 1600's. It was probably brought into Europe from the Orient. The wooden lute has a pear-shaped body. It has a flat top, a neck and fretted fingerboard, and a head or cross with screws for tuning. Usually the lute has six pairs of strings. The player plucks or strikes the strings with the right hand while stopping the strings with the left. See also DOWLAND, JOHN. CHARLES B. RIGHTER

LUTETIUM, *lyoo TEE shih um* (chemical symbol, Lu), is one of the rare-earth metals. It has an atomic number of 71 and an atomic weight of 174.99. The name comes from *Lutetia,* the ancient name for Paris. The French scientist Georges Urbain discovered lutetium in 1907. He developed a process for separating the original element ytterbium into two elements, lutetium and ytterbium, or neoytterbium. Lutetium is found with ytterbium in the minerals gadolinite, xenotime, and other minerals that bear rare earths. It is best separated from the other rare earths by ion-exchange processes. The metal has a silver color. It has a melting point between 3,000° F., and 3,180° F. Its boiling point is about 6,330° F. See also ELEMENT, CHEMICAL; RARE EARTH; YTTERBIUM. FRANK H. SPEDDING

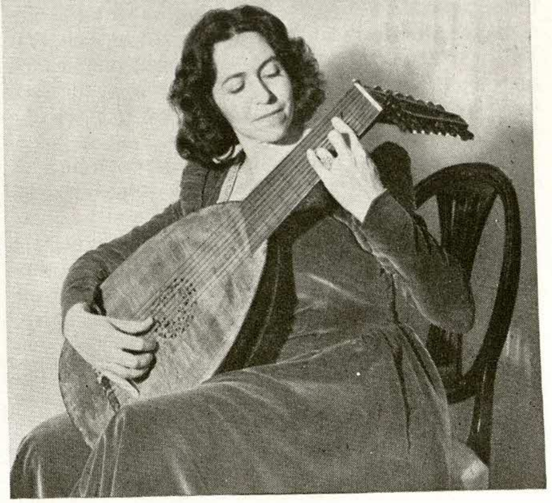


Luray Caverns Corp.

Electric Lights in the Luray Caverns of Virginia illuminate the beautiful colors of the caverns' rock columns.

The Lute Is a Very Old Musical Instrument. The body and neck resemble those of a large mandolin, but the angle at which the head is set into the neck gives it a distinctive appearance.

N.B.C.



LUTHER, MARTIN (1483-1546), led the Protestant Reformation in Germany. He also made an important contribution to German literature with his translation of the Bible, which introduced the "High" German of modern times. See GERMAN LANGUAGE (Development).

Early Life. Reform was in the air when Luther was born on Nov. 10, 1483, at Eisleben, Saxony, in the heart of Germany. His father had been a miner, and was still quite poor even after he became the owner of two small copper-smelting furnaces in Mansfeld. But he was determined that his son should receive a good education. Young Martin was sent to school at Magdeburg and at Eisenach, where he helped support himself by singing in the church choir and by singing in front of the homes of the rich. In 1501 he entered the University of Erfurt where he received a master's degree four years later.

Brown Bros.

Martin Luther

Priest and Teacher. Luther planned to become a lawyer, but changed his mind near the end of his university course. He came deeply under the influence of a religious revival that was beginning in western Europe. He entered the monastery of the Augustinian order at Erfurt, and in 1507 was ordained a priest. The next year he was appointed professor of philosophy at the new University of Wittenberg.

Another year of study at Erfurt was followed by a visit to Rome. In 1512, Luther received the degree of doctor of divinity and was appointed professor of theology at Wittenberg. There he began a course of lectures on the Bible which brought him much fame as a teacher. He was also made district vicar, and preached daily in the parish church.

At the University of Wittenberg, Luther became one of the most popular professors. Many of his colleagues and most of his students there gave him their wholehearted support during his later struggles with the officials of the Roman Catholic Church. It was there that Luther burned the papal bull which excommunicated him. This university later provided many of the men who went out through northern Europe to teach the Lutheran faith.

Justification by Faith. It was while performing his daily task of teaching that Luther resolved what he considered the conflict between the mercy and wrath of God, which had troubled his spirit for many years. He was lecturing on the Epistles of St. Paul when he suddenly saw a new significance in the statement that the "righteous shall live by faith." Faith, Luther concluded, was not an achievement by men but a gift which comes to man through the hearing and the study of the Word. Luther came to believe that faith justifies man before God, and that it is part of faith to trust God and to believe that He is, through Christ, constantly trying to save mankind. This insight became the motivating force of Luther's life and work. It was after he had reached this central conclusion that he encountered the indulgence of 1517.

The Ninety-Five Theses. Luther found that members of his parish were interested in obtaining indulgences. This upset him greatly. The pope granted indulgences in return for some work of piety, charity, or mercy, which might include a gift of money to further some good work. Pope Leo X had authorized Johann Tetzel, a Dominican monk, to preach indulgences near Wittenberg. One of the conditions for gaining this indulgence was a money offering toward building Saint Peter's Church at Rome. Part of the money was to be given to Prince Albert of Brandenburg to help the prince pay debts he incurred in a transaction by which he became bishop in three places.

Luther felt sure that the methods of Tetzel were harmful and contrary to the teachings of the church. He made his objections public in 1517 by nailing a protest to the door of All Saints' Church in Wittenberg. This protest has become famous as the Ninety-Five Theses. Luther did not intend to revolt against the Roman Catholic Church, but his action began the Protestant Reformation.

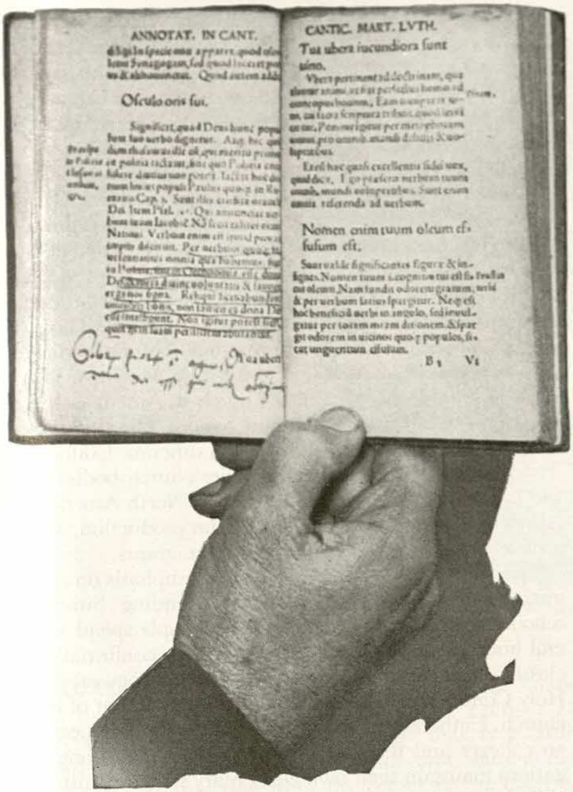
The Ninety-Five Theses were translated into German, and later into other languages. The new printing presses carried their message throughout Europe. Few Germans understood the theological questions Luther was arguing, but they did understand that money offered for indulgences went outside Germany.

Soon Luther was a center of dispute within the church. His study of the Bible and of church history and law carried him further and further from belief in the accepted Roman Catholic doctrines. By 1519, he denied the supreme power of the pope in a public debate with Johann Eck at Leipzig. The next year, Luther made known his beliefs in three pamphlets, *An Address to the Christian Nobility of the German Nation*, *The Babylonian Captivity of the Church*, and *The Liberty of a Christian Man*. As a result, the pope excommunicated, or banned, Luther from the church. When he received a copy of the papal bull excommunicating him, Luther burned it in public.

The Diet of Worms. The pope then ordered Luther to appear before the Imperial Diet, which met at Worms, Germany, in April, 1521. This was a gathering of German princes, nobles, and clergy, called by the newly elected Holy Roman Emperor Charles V. The Diet demanded that Luther retract his teachings. He answered: "Unless I am refuted and convicted by testimonies of the Scriptures or by clear arguments . . . my conscience is bound in the Word of God: I cannot and will not recant anything."

A Prisoner at Wartburg. The emperor condemned Luther as a heretic, or nonbeliever, but allowed him to start for home in safety in accordance with a promise made to Luther's good friend, Frederick, Elector of Saxony. Near Eisenach, a band of masked horsemen seized Luther and carried him to the Castle of Wartburg. Frederick ordered this because he feared for Luther's safety but dared not protect him openly. Luther spent 10 months in the castle, and used the time to translate the New Testament from the original Greek into German.

Leader of the Reformation. In March, 1522, Luther returned to Wittenberg to begin the work of organizing



U&U

Luther's Copy of the Song of Solomon was printed in Wittenberg, Germany, in 1539. At that time Luther was at the height of his career. The book has many scribbled notes and underlinings made by the leader of the German Reformation.

the new church. From that point on, the story of his life is the story of the Reformation.

The most formidable problem Luther faced was that his reformation seemed to have endangered all established authority. The knights of the Holy Roman Empire, threatened by the power of the princes and cities, used Luther as a justification for their unsuccessful rebellion in 1522. Even more serious was the revolt of the peasants against their oppression in 1524. They used Luther's idea of the priesthood of all believers to justify their demands for political and economic equality. Luther, at first, justified the peasants' demands to the princes. But after the rebellion had broken out, he sided against the peasants and condoned the bloody suppression of the revolt. For Luther, Christian liberty was a spiritual freedom which did not justify revolt against the magistrates. Luther believed these magistrates were appointed by God to rule over the people.

Luther increasingly stressed the need for order. He did not establish a binding new service for his church. His German Mass was not compulsory. In this way, the new church achieved spiritual freedom. But Luther did not object when the princes laid down rules for both church organization and church service. He also became increasingly intolerant of any form of Protestantism other than his own.

Other religious reformers had followed Luther, notably Huldreich Zwingli in Zurich and Martin Bucer in Strasbourg. These reformers met with Luther at Marburg in 1529 in order to work out a basis for Protestant unity against the menace of Roman Catholicism. But Luther was in no mood to compromise on matters of faith. Zwingli held a different view of communion from his own, believing that the body and flesh of Christ were present only in symbolic form. Luther believed that Christ was present in the elements of bread and wine. On this disagreement, Protestant unity faltered. Moreover, at Augsburg in 1530 when the humanist Philipp Melanchthon represented Luther in drawing up a confession of faith, Luther constantly restrained Melanchthon in his wish for compromises. The Swiss presented their own confession of faith, and Bucer a third. Thus, Luther's growing stubbornness caused the loss of large regions to rival reform movements.

Luther's stress on order did not mean a denial of spiritual liberty. He did not lay down binding church rules, yet he was active in transforming the liturgy of the church. The Mass became a communion service, and was spoken in the German language, rather than in the Latin language used in the Roman Catholic Mass.

Luther wrote catechisms for the instruction of the common people. He introduced singing by the congregation and wrote a number of fine hymns. The best known of these is "Ein Feste Burg," which, in English, begins with the line "A mighty fortress is our God." This song has been called "the battle hymn of the Reformation." Luther's hymns were first published in 1523. By 1545, he had written 37 hymns for the Protestant church. See HYMN.

Home Life. For some time, Luther had taught that parish priests might marry. In 1525 he took as his wife Katharina von Bora (1499-1552), a former nun. Their home was a happy one, with six children of their own and several orphaned nephews and nieces. The household also included student boarders and a number of poor students whom Luther supported.

His Work Completed. Luther continued throughout his lifetime to teach, to preach, and to write. His friend Philipp Melanchthon, who drew up the Augsburg Confession, worked with him in the Reformation. By 1534 Luther had completed his translation of the Bible by writing the Old Testament in German. Poor health made his task hard, but he continued working. Altogether he wrote more than 400 works. His writings ranged from short pamphlets to long books of a theological nature.

Luther died on Feb. 18, 1546, while on a visit to Eisleben, the town of his birth. His body was taken to Wittenberg for burial in the famous church to which, 29 years before, he had nailed his Ninety-Five Theses. In 1858, King Frederick William IV replaced the old wooden doors of the church with bronze doors, bearing the text of the theses.

GEORGE L. MOSSE

Related Articles in WORLD BOOK include:

Augsburg Confession
Bible (The Bible in Modern Tongues)
Eck, Johann
Indulgence
Melanchthon, Philipp
Peasants' War
Protestant
Reformation
Roman Catholic Church
Tetzel, Johann
Tyndale, William

LUTHER COLLEGE is a coeducational arts and sciences school at Decorah, Iowa. It is operated by the Evangelical Lutheran Church. Courses lead to bachelor's degrees. It has an extension division and summer sessions. The college was founded in 1861. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LUTHER LEAGUE OF AMERICA is the youth organization of the United Lutheran Church in America, a body of Lutheran congregations in the United States and Canada. The league develops programs for use in congregational youth groups, emphasizing worship, study, service projects, and recreation. It also sponsors conventions, rallies, workers' conferences, and Bible camps. The *Walther League* is a similar organization associated with the Lutheran Synodical Conference. Almost all its societies belong to The Lutheran Church—Missouri Synod. The Walther League, an international group, has societies in the United States, Canada, Great Britain, and France. LESLIE CONRAD, JR.

LUTHERANS are members of the Lutheran Church, the oldest and largest Protestant church. They follow the doctrines and beliefs set forth by Martin Luther, the leader of the Reformation in Germany. Luther taught his followers that the Bible—rather than a church, council, or pope—is the only authority for Christian faith and life.

Beliefs. The Augsburg Confession, drawn up in 1530, contains the basic doctrines of Lutheranism (see AUGSBURG CONFESSION). Lutherans believe that God revealed Himself to man as a Father, the Creator of the universe; as Jesus Christ, whose birth, death, and resurrection made eternal life possible for mankind; and as the Holy Spirit, who calls men into fellowship with Christ in the Christian Church. They consider all who believe in Christ to be members of the true church.

The Lutheran Church emphasizes the Biblical teaching that all human beings are imperfect and subject to death. But members believe that through their faith in Christ, the forgiveness and power of God will enter their lives. They demonstrate the new life that God gives them through deeds of kindness and love. Lutherans also maintain that every person is responsible to God for the way he lives. He must do his daily work as a service to God and his neighbor. Lutheranism regards all vocations as equally honorable.

Lutherans observe two sacraments, Baptism and Holy Communion (see BAPTISM; COMMUNION). They believe that, through Baptism, God forgives sin and accepts a person into His family. Baptism may be administered to children as well as to adults. Lutherans maintain that in Holy Communion, or the Lord's Supper, Christ is truly present to bring forgiveness and spiritual strength to the person who communes.

Worship in Lutheran churches generally follows an established *liturgy*, or order of service. The congregation takes a prominent part in the service. A cross and lighted candles stand at the altars of most Lutheran churches. A pastor, wearing special church vestments, conducts the service from the altar. Pastors usually receive eight years of training after high school.

Organization. Lutherans make up the world's largest and most widespread Protestant group. They number about 70,000,000, or one third of all Protestants. About 37,000,000 Lutherans live in Germany, 19,000,000 in the Scandinavian countries, and 4,000,000 in the rest of Europe. The church has about 8,250,000 members in North America, with about 250,000 of them in Canada. The Lutheran Church is the official church of Denmark, Finland, Iceland, Norway, and Sweden. About 60 church bodies belong to the Lutheran World Federation, with headquarters in Geneva, Switzerland. The federation operates in the fields of world missions, theology, public information, and assistance to refugees.

Lutherans constitute the third largest Protestant group in the United States. Their 17,000 congregations are organized into regional synods, or districts. These, in turn, are grouped into international church bodies. The three major church bodies are The American Lutheran Church, the Lutheran Church in America, and the Lutheran Church—Missouri Synod. The first two cooperate through the National Lutheran Council. The third works with several smaller church bodies in the Lutheran Synodical Conference of North America. All three cooperate in world relief, film production, and service to military personnel and immigrants.

The Lutheran churches place great emphasis on religious education. In addition to attending Sunday schools and vacation schools, young people spend several hours a week for one or two years in confirmation classes. After confirmation, a young person may receive Holy Communion and become a voting member of the church. Lutherans in the United States support nearly 50 colleges and theological seminaries. Many congregations maintain their own elementary schools. Lutherans also conduct work on the campuses of 600 nonchurch colleges and universities. The churches sponsor more than 500 institutions and agencies for service to the sick, aged, handicapped, and poor.

For membership of the Lutheran churches in the United States, see RELIGION (table). For information concerning the early history of Lutheranism, see LUTHER, MARTIN. PHILIP A. JOHNSON

See also LUTHER LEAGUE OF AMERICA; REFORMATION.

LUTYENS, SIR EDWIN L. (1869-1944), an English architect, won fame for the homes he designed. As a young man, he made designs for small houses in Surrey, and later became architect for many English country houses and public buildings. In 1912, Lutyens helped plan the site of Delhi, India, and designed Government House, in Imperial Delhi. His better-known works include the Whitehall Cenotaph in London (1920) and the British Embassy in Washington, D.C. (1926). Lutyens was born in London. WILLIAM T. ARNETT

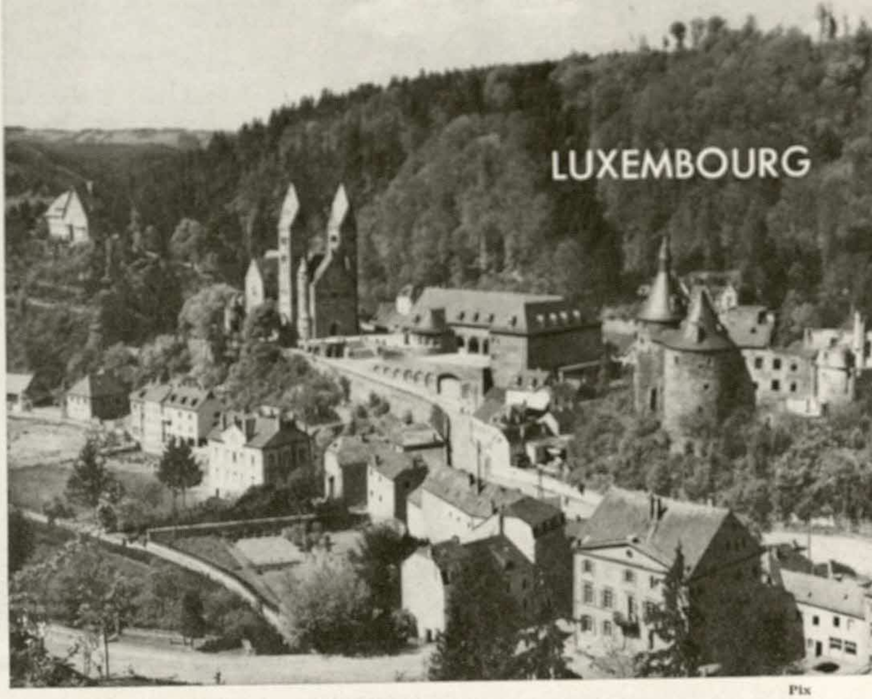
LÜTZEN, *LYOOT suhn,* **BATTLES OF,** were two famous battles fought near the town of Lützen in east-central Germany. The first battle took place in November, 1632, during the Thirty Years' War. King Gustavus Adolphus of Sweden united his forces with those of Duke Bernard of Weimar. Together they met and defeated the army of the Holy Roman Emperor led by Albrecht von Wallenstein. The victory saved the day for Protestantism in Germany, but the Swedes suffered the loss of their leader.

The second battle occurred on May 2, 1813, when Napoleon's forces defeated the united Russians and Prussians. ROBERT B. HOLTMAN

See also GUSTAVUS (II); THIRTY YEARS' WAR.

LUX. See FOOT-CANDLE.

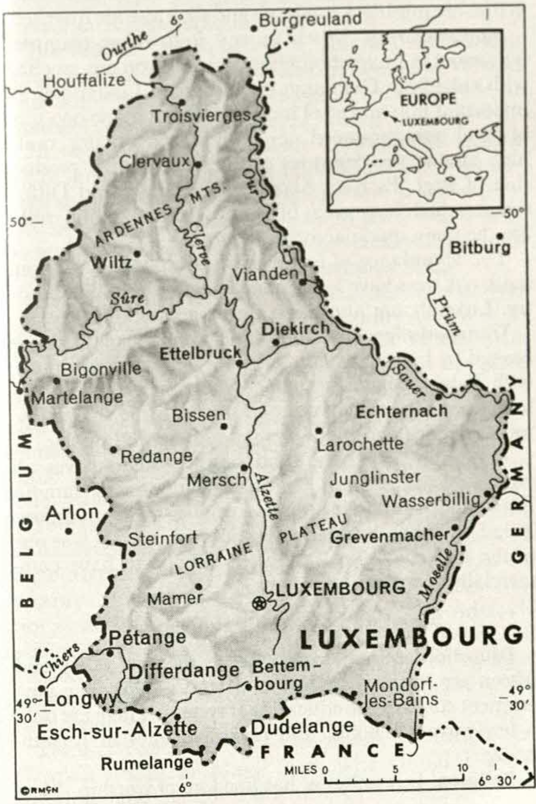
LUXEMBOURG



Scenic Luxembourg contains rolling hills, picturesque cities, forests, and ancient castles. Clervaux, pictured here, is the chief town in the northern part of Luxembourg.

Pix

LUXEMBOURG, *LUCK sem boorg*, is one of the smallest and oldest independent countries in Europe. It covers an area in northwest Europe that is a little smaller than Rhode Island. A half-hour automobile drive in any direction from the center of the country takes a traveler to one of Luxembourg's borders. The country is a constitutional monarchy. The official name of Luxembourg in French is GRAND-DUCHÉ DE LUXEMBOURG, or GRAND DUCHY OF LUXEMBOURG. *Duchy* means that the country is ruled by a grand duke or duchess. The city of Luxembourg is the capital and largest city.



Luxembourg is a beautiful country. More than 130 ancient castles dot the landscape, giving it a quaint, picturesque look. The people have a high standard of living, and there are seldom as many as a dozen unemployed persons in the entire country. Iron and steel is Luxembourg's most important industry.

The Land and Its Resources

Location, Size, and Surface Features. Belgium, West Germany, and France border Luxembourg. The Ardennes Mountains cross northern Luxembourg.

FACTS IN BRIEF

Type of Government: Constitutional monarchy.

Capital: Luxembourg.

Divisions: 4 electoral districts.

Head of State: Grand duke or grand duchess.

Parliament: Chamber of Deputies, 52 members (six-year terms).

Area: 998 square miles. *Greatest distance:* (north-south) 55 miles; (east-west) 35 miles.

Elevation: *Highest*, 1,854 feet, in the Ardennes Mountains near the Belgian border; *lowest*, 453 feet, on the Moselle River as it leaves Luxembourg for Germany.

Population: 290,992. *Density*, 291 persons per sq. mi. *Distribution*, urban, 75 per cent; rural, 25 per cent.

Chief Products: *Agriculture*, cattle, grapes, oats, pigs, potatoes, wheat. *Mining*, iron ore. *Manufacturing*, beer, ceramics, fertilizer, leather, pig iron, steel, wine.

Flag: The flag has three horizontal stripes, the top red, the center white, and the bottom blue. See FLAG (color picture, Flags of Europe).

National Anthem: "Ons Hémecht" ("Our Homeland").

Money: *Basic unit*, Franc. For its value in dollars, see MONEY (table, Values).

Camera Press, Pix

The Castle at Vianden in Luxembourg Was a Refuge for the French Author Victor Hugo in the 1860's.

Southern Luxembourg is part of the Lorraine Plateau that runs through eastern France. The country covers 998 square miles.

Natural Resources. The soil is fertile in the south, but not very good in the north. The country has large forests that yield wood and bark for industries. In the southwest, there are deposits of iron ore.

Climate. Winters are mild and summers are warm. The average temperature is about 50°F. About 32 inches of rain falls each year.

The People and Their Work

The People. Luxembourg has 290,992 people. Most Luxembourgers have intermarried with the people of nearby countries that have ruled the grand duchy at various times. As a result, many persons are partly of French, Belgian, Dutch, or German origin.

The people speak their own language, called *Luxembourgeois*. They also speak French and German.

Way of Life. Luxembourgers are happy people, with a strong spirit of freedom. A favorite and typical expression is *mir wölle bleiwe wat mir sin*, meaning *we want to remain what we are*.

The people eat well, and are comfortably clothed and housed. The average family has more American items, such as refrigerators and automatic washing machines, than families in any other European country. Favorite foods include Ardennes hams, fresh-water fish, and pastries. Moselle wine and beer are popular.

Cities. The city of Luxembourg (pop. 64,840) is the capital of the country. Important cities include Esch-sur-Alzette (pop. 26,851); Differdange (pop. 15,179); Dudelange (pop. 12,878); and Pétange (pop. 10,456). Other cities, together with their populations, are Kayl (5,471); Schifflange (5,124); Bettembourg (5,061); Ettelbruck (4,452); and Wiltz (4,098).

Agriculture. Luxembourg is a land of small landowners. About 60 out of every 100 acres are used for farming or grazing. Oats, potatoes, and wheat are the principal crops. Many grapes are grown in terraced vineyards in the southeastern part of the country. There is considerable livestock, especially cattle and pigs.

Mining. Although Luxembourg is a very small country, it has one great resource, iron ore. Deposits are located in the southern part of the country. Luxembourg ranks ninth among the countries of the world in iron-ore mining. Limestone and slate also are quarried.

Manufacturing. Much money from other countries is invested in Luxembourg's industries. Iron ore, smelted with coke from Germany, is the base of Luxembourg's important iron and steel industry. About 2,700,000 tons of steel are produced annually. Luxembourg ranks high among the countries of the world in the production of steel. Esch-sur-Alzette, Dudelange, and Differdange, which have great blast furnaces and rolling mills, are the main manufacturing centers.

The abundance of cattle and a supply of bark from scrub oak trees have led to a large leather-tanning industry. Luxembourg also has a thriving wine industry.

Transportation and Communication. Luxembourg is crossed by important railroad lines that connect France with Belgium and Germany. Altogether, the country has about 200 miles of railroad tracks. More than 2,600 miles of roads and highways serve the grand duchy.

Telegraph, telephone, and postal systems cover all parts of Luxembourg. Radio Luxembourg is famous throughout Europe for the fine quality of its programs. Tele-Luxembourg began operations in 1955. It was one of the first television stations in Europe to have commercially sponsored programs.

Social and Cultural Achievements

Education. All children between the ages of six and fifteen are required by law to attend school. The government controls the educational system. There are only a few private schools, and no universities in Luxembourg.

Religion. Luxembourg has freedom of worship. Most of the people are Roman Catholics. There are only about 6,000 non-Catholics in Luxembourg.

Government

Luxembourg is a constitutional monarchy. It is governed under the constitution of 1848, which has been revised several times. Luxembourg is ruled by a grand duke or grand duchess of the House of Nassau. Laws are passed by the Chamber of Deputies, whose members are elected by the people for six-year terms. All citizens over the age of 21 may vote.

The chief governing authority rests in a cabinet appointed by the ruler. The cabinet is led by the prime minister. A Council of State advises the grand duke or grand duchess on state affairs. Its 15 members are appointed for life by the ruler.

History

Early Years. Luxembourg's geographic position in Europe has exposed the country to many battles. The country originally was called *Lucilinburhuc* (little castle). It was one of the minor principalities of the Holy Roman Empire. It became prominent in 1308 when Count Henry IV of Luxembourg became Henry VII, Holy Roman Emperor.

Henry's grandson, Emperor Charles IV, raised Luxembourg to the rank of a duchy. He gave it to his half brother, Wenceslas, whose family held it until 1437. Then it was owned by Burgundy and Austria.

In 1555, Luxembourg became Spanish property, but remained a part of the Holy Roman Empire. The Peace of Utrecht of 1713, at the end of the War of Spanish Succession, gave the duchy to Austria. France gained control of Luxembourg in 1795.

The 1800's. The Congress of Vienna made Luxembourg a grand duchy. It gave Luxembourg to William I of The Netherlands in 1815, in exchange for his estates of Nassau, which went to Prussia.

In 1830, attempts were made to include all Luxembourg in the new kingdom of Belgium. In 1839, the western part was given to Belgium, and is still a province of that country. But the eastern part, which is the present country of Luxembourg, remained an independent country under The Netherlands' king.

The Treaty of London in 1867 made Luxembourg a neutral, unarmed territory. The country was ruled by the kings of The Netherlands until 1890. In that year, William III died and was succeeded by his daughter, Wilhelmina. Luxembourg then broke away from The Netherlands because its laws did not then permit a female ruler. Duke Adolph of Nassau (1817-1905) became ruler of Luxembourg, as grand duke. He was followed by his son, William Alexis (1852-1912).

The 1900's. On William's death, the throne passed to his eldest daughter, Marie Adélaïde (1894-1924). At the outbreak of World War I, the Germans overran the country. Luxembourg remained under German control until the end of the war. In 1919, Marie Adélaïde abdicated in favor of her sister, Charlotte (1896-).

Luxembourg made a treaty with Belgium in 1922 which abolished most taxes and customs between the two countries.

During World War II, Luxembourg was invaded by German troops in May, 1940. The Grand Duchess Charlotte and her government went into exile in London and Montreal. Luxembourg became an important battleground at the end of 1944 and in early 1945, when part of the Battle of the Bulge was fought in the northern part of the country. Thousands of American soldiers who were killed in this battle are buried in a military cemetery at Hamm, near the capital.

Grand Duchess Charlotte returned to Luxembourg after World War II. The country became a charter member of the United Nations in 1945. In 1948, it joined with The Netherlands and Belgium in an economic union called *Benelux*. In 1949, the grand duchy joined the North Atlantic Treaty Organization, and the Council of Europe. In 1952, the European Coal and Steel Community was created to pool the coal and steel resources of six European countries. Its headquarters are in the city of Luxembourg. George Kish

Related Articles in World Book include:

Ardennes Mountains and Forest
Benelux
Charlotte
Christmas (In The Netherlands, Belgium, and Luxembourg)
Europe, Council of
European Coal and Steel Community
European Payments Union
Iron and Steel
Luxembourg (city)

LUXEMBOURG (pop. 64,840) is the capital and largest city of the country of Luxembourg. It is in the south-central part of the country, about 120 miles southeast of Brussels, Belgium. The city perches on the top of steep rocky cliffs high above the Alzette River.

The city started as a small fort. It gradually was strengthened until it was one of Europe's strongest fortresses. The grand ducal palace and the cathedral date back to the 1500's. George Kish

The City of Luxembourg is perched on a plateau that is cut steeply on three sides by the Alzette and Petrusse rivers.

Edo Koenig, Black Star

LUXOR. See Egypt, Ancient (color map); Obelisk (picture).

LUXURY TAX. See Taxation (Kinds of Taxes).

LUZERN. See Lucerne.

LUZON. See Philippines (The Islands).

LVOV, *luh VAWF,* or **LWÓW,** formerly called Lemberg (pop. 410,000), is an industrial center in the Ukraine in western Russia. For location, see Russia (color map). Metal-working and petroleum refining are its important industries. Lvov is also an educational center. Modern buildings stand in the city's suburbs.

Lvov, founded in the 1200's, was the Galician capital in the former Austro-Hungarian Empire. After World War I, it became a Polish city. Russian troops occupied it in 1939. Theodore Shabad

LYALLPUR, *LYE uhl pour* (pop. 179,144), is the capital of Lyallpur District in West Pakistan, and one of the largest cities in the country. It lies 75 miles southwest of Lahore. For location see Pakistan (color map). Lyallpur is a wheat center. Chief industries include the milling of flour, cotton, oilseed, and sugar, and the manufacture of ice, ghee (a type of butter), dyes, and farm equipment. Lyallpur was founded in the late 1800's.

LYCANTHROPY. See Werewolf.

LYCÉE. See France (Education).

LYCEUM, *lie SEE um,* is an organization that sponsors lectures, concerts, and other adult educational programs. The name comes from the philosophical school of Aristotle in ancient Athens (see Aristotle). Josiah Holbrook started the American lyceum movement in 1826 at Millbury, Mass. In 1831, local lyceums united to form an American Lyceum which held national conventions until 1839.

The main purpose of the early lyceum movement was to improve the schools, bring about better teacher training, and establish libraries. The Chautauqua movement and universities took over most of the lyceum's work after 1850. R. Freeman Butts

See also Chautauqua.

LYCEUM was a park outside ancient Athens. It was sacred to the Greek god Apollo Lyceus. It contained groves of fine trees, a ring for cavalry training, and a gymnasium in the form of an open court, surrounded by cloisters, or *peripatoi.* Socrates and Plato often visited the Lyceum. During a later period, Aristotle located his school at the Lyceum. Its members became known as *Peripatetics.* C. Bradford Welles

LYCHEE. See Litchi.

LYCOMING COLLEGE is a coeducational liberal arts school at Williamsport, Pa. It is affiliated with the Methodist church. Graduates receive bachelor's degrees. The college has cooperative programs in engineering with Bucknell University and Pennsylvania State University, and in forestry with Duke University. The college was founded in 1812. For enrollment, see Universities and Colleges (table).

LYCURGUS, *lie KUR gus,* was a Spartan legislator. He is supposed to have set up the government that made Sparta the great military power of the Greek states. His birth and death dates and his exact achievements are uncertain.

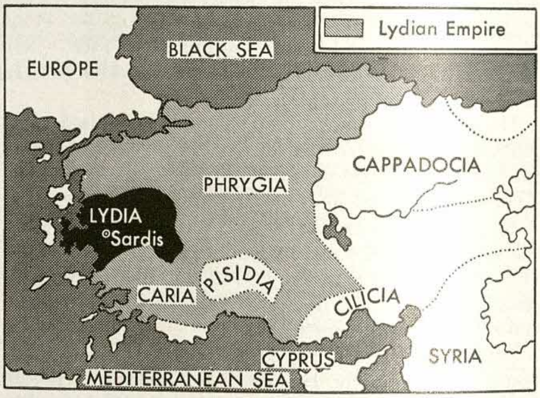
Lycurgus probably lived during the 800's B.C., and was a member of one of the two Spartan royal families. The stories about him say that he traveled to other parts of Greece, and to Asia and Egypt, to study their laws. On his return, he was asked to develop a new form of government for Sparta.

The system he devised was designed to eliminate weaklings. Strict supervision from birth enforced discipline and military training. Lycurgus made his countrymen promise that they would not change the system of government until he returned from another trip. Then he went into exile, and so forced the Spartans to keep the government he had planned. C. Bradford Welles

See also Sparta.

LYDDITE is an explosive mixture of picric acid and collodion. In the Boer War, the British used lyddite to fill shells. The explosive known as TNT later proved more effective. See also Collodion; Picric Acid; TNT.

LYDIA was an ancient country in Asia Minor. It was famous for its fertile soil and its rich mineral deposits, especially the gold of the River Pactolus. In the 600's B.C., Lydia was an independent and prosperous kingdom. In 546 B.C., the Persians conquered Croesus, the last king of the Lydians. Later, Lydia fell to the Macedonians and the Romans.



Lydia Was a Great Center of Commerce.

Because Lydia lay at the western end of the great road connecting Mesopotamia and the East with the Aegean Sea and Greece, it was always a great commercial center. It was the first Western country to cast coins. The Lydians also are supposed to have invented the arts of dyeing wool and of smelting and working ore. Their capital city, Sardis, was discovered by archaeologists in 1958. Joseph Ward Swain

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Thyatira

LYE (chemical formula NaOH) is a powerful alkali often used in the home to clean clogged plumbing pipes. Lye is white and powdery. Its chemical name is *sodium hydroxide.* Like other bases, lye neutralizes acids. It is formed by mixing a less expensive alkali, calcium hydroxide, with sodium carbonate. Lye destroys wastes because it eats into organic material. See also Alkali; Antidote; Caustic. George L. Bush

LYELL, *LIE ul,* **SIR CHARLES** (1797-1875), a British scientist, is often called the founder of modern geology. Between 1830 and 1833, he published the three volumes of his *Principles of Geology,* which organized existing

Brown Bros.

Sir Charles Lyell

information about that science. Lyell showed in his book that the earth has changed slowly and gradually through the ages by means of processes that are still going on. Until then, many persons believed that changes in the earth occurred in sudden worldwide upheavals.

The book was so successful that Lyell spent much of his life preparing new editions and keeping them up to date. He was among the first scientists to accept modern theories about the Ice Age and evolution. His book *The Antiquity of Man* (1863) concerned prehistoric man in Europe. He also wrote *Travels in North America* (1845) and *A Second Visit to the United States of North America* (1849).

Lyell was born in Kinnordy, Scotland, and studied at Oxford University. He practiced law before he became a scientist. CARROLL LANE FENTON

See also GEOLOGY (James Hutton and Sir Charles Lyell).

LYMPH, *lihmf*, is a colorless fluid that resembles blood plasma in composition. It contains no red blood cells and much less protein than does plasma. Lymph is the fluid that bathes and nourishes the body cells. It consists of water, digested foods, white blood cells, other chemical substances, and waste materials given off by the cells.

Lymph is the intermediate substance between the blood and the other tissue cells of the body. It is formed from the plasma of the blood. The plasma filters, or *diffuses*, out of the blood capillaries into the tissues, carrying food substances and oxygen. The lymph later returns, either directly or indirectly, to the blood stream, carrying off waste matter and toxic substances from the cells.

The lymph that returns directly to the blood stream simply goes back into the blood capillaries. But lymph returning indirectly diffuses first into tiny lymph vessels that lie close to the blood capillaries.

The lymph vessels, or *lymphatic system*, make up a circulatory system somewhat similar to the blood circulatory system. The tiniest vessels that the lymph enters when it returns from the tissues are called *lymph capillaries*. Lymph capillaries empty into larger and larger vessels called *lymphatics*. The lymphatics have thin walls and valves and are much like veins. The smaller lymphatics unite to form larger vessels called *trunks*, and the trunks finally pour the lymph into two large *ducts*. The *right lymphatic duct* and the *thoracic duct* empty into the large veins at the sides of the neck. The thoracic duct, along the front of the spine, is about 15 inches long.

Chyle is a kind of lymph that has particles of digested fat suspended in it. These particles make the chyle look milky. Chyle gets its fat from *chyme*, a substance in the small intestine, and carries it to the rest of the body.

Movement of the lymph through the lymphatics is accomplished by contractions of muscles that surround the vessels. Large accumulations of lymphatic tissue called *lymph nodes* occur along the trunks of the lymphatics. These nodes contain lymphocytes and other active cells, and can filter out any abnormal material. In this way, lymph nodes help regulate the amounts of poisonous substances or microorganisms that enter the blood. The lymph nodes, sometimes called *lymph glands*, are most plentiful in the neck, armpit, and groin, at the roots of the lungs, and along the large veins of the abdomen and chest. WILLIAM DAMESHEK

See also BLOOD; DIGESTION; HODGKIN'S DISEASE.

LYNCH, THOMAS, JR. (1749-1779), was a South Carolina signer of the Declaration of Independence. He served in South Carolina's first general assembly and in the Second Continental Congress. Lynch was born in Winyaw, S.C. He was graduated from Cambridge University and then studied law in London. In 1775, while he was serving in the Revolutionary War, a severe illness left him a semi-invalid. Lynch sailed on a voyage in an attempt to regain his health, but his ship was lost at sea. RICHARD B. MORRIS

LYNCHBURG, Va. (pop. 54,790; alt. 795 ft.), is one of the leading dark-leaf tobacco markets in the United States. It lies at the foot of the Blue Ridge Mountains on the James River in the south-central part of the state. For location, see VIRGINIA (color map).

Lynchburg has one of the largest plants in the world for making tannin (see TANNIC ACID). It also has an atomic equipment plant; a battery factory; an electric products plant; iron foundries; paper, flour, and textile mills; and shoe factories. Lynchburg College and Randolph-Macon Woman's College make their homes in the city. Lynchburg does not lie in any county. It is an independent city surrounded by Amherst, Bedford, and Campbell counties. Founded in 1786, Lynchburg was named for John Lynch, who operated a ferry across the river. It has a council-manager form of government. FRANCIS B. SIMKINS

LYNCHBURG COLLEGE is a coeducational liberal-arts school at Lynchburg, Va. It is affiliated with the Disciples of Christ Church. Courses lead to bachelor's degrees. There is a distinctive program of training for religious vocations. Lynchburg was founded in 1903. For enrollment, see UNIVERSITIES AND COLLEGES (table).

LYNCHING usually means the killing, generally by hanging, of a person by a mob in defiance of law and order. The victim does not have a chance to defend himself. The mob simply assumes him guilty, whether or not he has had a trial. Lynch mobs not only promote disrespect for law, order, and basic human rights, but also encourage mass brutality.

Most states have attempted to stop lynchings by laws. Some states prosecute under the laws against homicide, riot, and assault. Other states have specific lynch laws. But legal controls have not succeeded in preventing lynchings. One of the problems is the difficulty in picking out the leaders of the mob. Another difficulty is the reluctance of juries to render a conviction, even with evidence. The decline in the number of lynchings is due primarily to increasing public opinion against the mob violence they represent.

The term *lynching* probably originated with Charles Lynch, a planter who lived in Virginia during the 1700's. Lynch and his neighbors took the law into their own hands and punished *Tories*, or British sympathizers, and others who plundered their property. The term came to be applied to physical punishment such as whipping and tarring and feathering. In pioneer communities on the far western frontier, many lynch mobs punished persons for horse stealing, highway robbery, or murder. Lynchings began to take the form of hangings. During this period, people took the law into their own hands because there was no duly established legal authority. With the establishment of law and order throughout the United States, lynch mobs began to act in opposition to the law, instead of supporting it.

Before 1890, most lynching victims were white. Since then, most lynchings have occurred in the South, and the victims have usually been Negroes. About 4,730 lynchings occurred between 1882 and 1951, including 1,293 whites and 3,437 Negroes. The peak year for these killings was 1892, with 230 victims. From 1951 to 1960 there were about five lynchings. New England is the only section of the United States in which no lynchings have ever occurred. MARVIN E. WOLFGANG

See also PIONEER LIFE (Law and Order); VIGILANTE.

LYNN, Mass. (pop. 94,478; alt. 25 ft.), is a bustling manufacturing city located on Massachusetts Bay 10 miles north of Boston (see MASSACHUSETTS [color map]). Lynn was settled in 1629 under the name of SAUGUS. It has been a manufacturing community ever since its founding. Residents began making shoes in the 1630's, and by 1700 practically every house had a shoemaking shop in the yard. The change from hand-made to machine-made shoes in the mid-1800's put many of the older craftsmen out of business, but brought in many immigrants to operate the machines. Lynn was the leading shoe center of the country until a disastrous fire in 1889 wiped out part of the city.

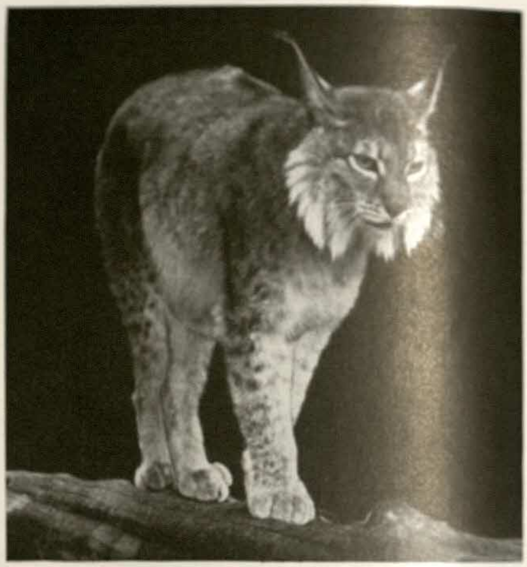
Lynn still produces quantities of shoes, but its modern prosperity depends on two huge plants of the General Electric Company. These plants make up the largest single payroll in the state. Skilled workers turn out generators, gyroscopes, jet engines, measuring devices, and steam turbines. Other important Lynn products include bread and bakery goods, incandescent and fluorescent lamps, medicines, screw machine products, shoe boxes, and women's clothing.

Lynn received its city charter in 1850. It has a mayor-council form of government. WILLIAM J. REID

LYNX, *links*, is a wild animal of the cat family. Lynxes live in the northern parts of Europe, Asia, and North America. True lynxes are considerably smaller than leopards, but weigh from 20 to 25 pounds and sometimes as much as 45 pounds. The true lynx of North America is called the *Canada lynx*. It ranges across Canada and Alaska and southward into northern New England, New York, Colorado, and Oregon. A close relative found mostly in the United States south of Canada is called the *bobcat*, or *wildcat*.

The lynx's fur grows long all over its body, even on its cheeks. The fur is light gray or grayish brown and long and silky. It is spotted and striped with a darker shade. The fur is valuable for scarves and ladies' jackets. Lynxes have stumpy tails, and pointed ears.

These animals live in forests or in rocky places, and prowl mostly at night. They kill foxes, small deer, and occasionally sheep and chickens. However, they also kill great numbers of rabbits and mice and other rodents that are pests to man. In winter the huge feet of the lynxes serve as snowshoes. This enables lynxes to travel swiftly over the snow while hunting. Most of their prey cannot travel so fast because they break through the crust of snow.



Hollsher

The Siberian Lynx, like the other lynxes, is a large and powerfully built cat with tufted ears.

Lynxes sleep in caves or hollow trees. They like to climb trees and lie stretched out on a limb. Young lynxes look like kittens. The mother lynx fights viciously anything that comes near her young. She bears from one to five babies in a litter.

Scientific Classification. Lynxes belong to the cat family *Felidae*. The Canada lynx is genus *Lynx*, species *canadensis*. The bobcat is *L. rufus*. VICTOR H. CAHALANE

See also BOBCAT; CARACAL; CYCLE; FUR; WILDCAT.

LYON, *lee AWN* (pop. 471,270; met. area, 755,000; alt. 770 ft.), is the third largest city in France. It has won great fame for its silk and rayon fabrics. Lyon is in southeast France, about 170 miles north of Marseille. The Rhône and Saône rivers meet at Lyon, dividing the city into three parts. The central part lies on the peninsula between the rivers, and is the business and social center of Lyon. The old town is on the west bank of the Saône, and includes a large library. The new town, on the east bank of the Rhône, includes the university, many fine residences, and manufacturing plants. For location, see FRANCE (color map).

Lyon is a busy, modern city, but it has many streets and buildings that date from the Middle Ages. The Cathedral of Saint Jean, a fine example of Gothic architecture, was begun in 1110. The Church of Saint Martin d'Ainay dates from the 800's. Other interesting buildings include the Palace of Commerce,. the Town Hall, and the Church of Notre Dame de Fourvières.

Along the river front, Lyon has many docks and warehouses. The city is in a region where the manufacture of textiles ranks as the chief industry. Spinning, weaving, dyeing, and chemical plants in Lyon employ

Lyon, France, lies along the Saône and Rhône rivers. The Church of Notre Dame de Fourvières stands on the Hill of Fourvières. This impressive church attracts many pilgrims.

French Government Tourist Bureau

thousands of workers. Lyon is also an important center of trade for many products, including coal, charcoal, metal goods, wine, cheese, and chestnuts.

In the days of the Roman Empire, Lyon was a town called *Lugdunum*. Later it became a stronghold for Christianity in the West. Its silk industry rose to importance during the 1400's. The invention of the Jacquard loom for weaving figured silks brought new prosperity in the 1800's.

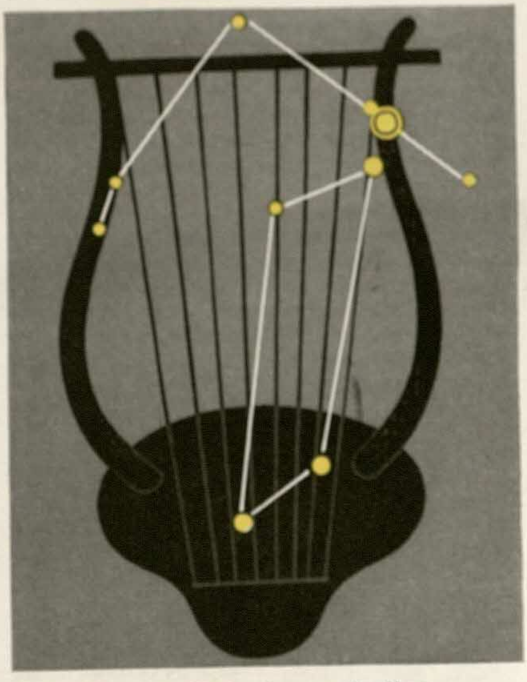
Lyon suffered heavy damage during World War II. The city strongly resisted German attempts at occupation, but was forced to surrender. Resistance leaders in Lyon continued their activities during the German occupation. The resistance leaders, aided by French and American armies, freed Lyon from German rule in 1944. Robert E. Dickinson

LYON, MARY (1797-1849), pioneered in providing higher education for women. She founded Mount Holyoke College, which opened as Mount Holyoke Seminary in 1837, and served as president of the school until her death. She aimed, through educational opportunities, to help young women develop their abilities and talents and to use them in service to others. Miss Lyon became a teacher at the age of 17. With her savings, she later attended school in Amherst. She was born in Buckland, Mass. Claude A. Eggertsen

LYRA, or **THE HARP,** is a small constellation of stars located west of the Northern Cross. It contains Vega, the sixth brightest star in all the heavens, and the third brightest in the northern celestial hemisphere. Because of the precession of the equinoxes, Vega will be considered the North Star in about 12,000 years.

Lyra has several double stars. One of them, *Epsilon Lyrae*, is visible to the keen eye as a pair of stars. Through a telescope, each of these stars is seen to be double. The Ring, or Annular Nebula, is another beautiful sight in Lyra. It is one of a class of objects that astronomers believe originated when central stars threw off great waves of gaseous material. I. M. Levitt

See also Double Star.



The Constellation Lyra, or the Harp.

LYRE, *lire*, is a musical instrument dating far back in history. It was used by the Greeks and probably came from Asia. It was made of a hollow sounding board from which two armlike pieces stretched upward. These arms held a crosspiece, or yoke, with 3 to 10 strings attached to it. The sound was made by plucking the strings with the fingers or a pick.

The lyre was the symbol of Apollo, the god of music and poetry. It was a favorite among the Greeks for

Metropolitan Museum of Art

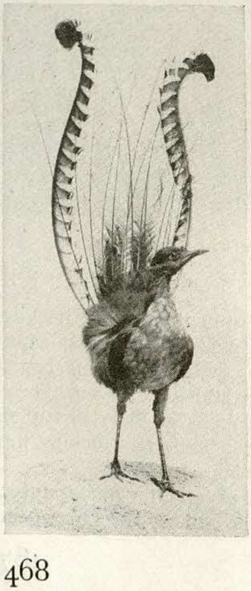
Woman Playing a Greek Lyre, painted on a vase about 350 B.C. Apollo, the god of music, was usually painted holding a lyre.

accompanying songs and recitations. The words *lyric* and *lyrical* come from this usage. The lyre was very similar to the cithara. Charles B. Righter

See also Apollo; Zither.

LYREBIRD is one of the most unusual Australian birds. The tail of the male lyrebird has large and spreading feathers which are arranged like the ancient lyre, or harp. Two broad feathers curve upward like the sides of a lyre, with slender feathers in between. When the tail is held erect, it is about 2 feet long. It is much larger than the bird itself, which is about the size of a large chicken. The tail does not reach full growth until the bird is 7 or 8 years old.

The lyrebird has brown and green plumage. These birds are sweet singers, and they can imitate the songs of other birds. They are also rapid runners. They make their nest on the ground, and the female lays one egg in it. The nest is well woven and dome-shaped.



The Male Lyrebird proudly displays its handsome tail and sings a sweet song to attract females during the mating season.
American Museum of Natural History

Scientific Classification. Lyrebirds belong to the family *Menuridae.* They are genus *Menura,* species *novaehollandiae,* and *M. alberti.* Rodolphe M. deSchauensee

See also Bird (color picture, Birds of Other Lands).

LYRETAIL. See Fish (color picture, Tropical Fresh-Water Fishes).

LYRIC POETRY. See Poetry.

LYS RIVER. See Belgium (Agriculture).

LYSANDER, *lie SAN der* (? -395 B.C.), was a warrior of the Greek state of Sparta. His defeat of the Athenian fleet in 405 B.C. resulted in Athens' surrender to Sparta the next year. This ended the Peloponnesian War (see Peloponnesian War).

Lysander became the leader of Greece, and established Spartan control over the various city-states. His highhanded measures aroused opposition in Sparta, and he was driven from control in 403 B.C. In 395 B.C. he commanded an army in the battle of Haliartus, where he was killed. C. Bradford Welles

LYSIAS, *LISS ih us* (? -380 B.C.?), one of the great Athenian orators, became famous for his clear, graceful style. He composed speeches that others used, skillfully making each person speak in character. His father, a wealthy man, came to Athens from Syracuse. Lysias fought for democracy against the Thirty Tyrants about 404 B.C. (see Thirty Tyrants). C. Bradford Welles

LYSIPPUS, *lie SIP us,* was a famous Greek sculptor of the 300's B.C. He produced bronze statues ranging in size from small figurines to colossal works such as the 60-foot-high *Zeus* of Tarentum. He changed the rules of sculpture for the proportions of the human body, making the heads smaller and the bodies slenderer. He won praise for the extreme delicacy of his work in even the smallest details.

An ancient story tells that Lysippus put a gold coin in a box each time he sold a statue. When the box was opened after his death, it supposedly contained more than 1,500 coins. It is surprising that not one of his statues survives today. Nor is any Roman statue in marble known to be an exact copy of a Lysippus original, although many show his influence. Two statues of young athletes are considered to be the closest examples of his influence, the *Apoxyomenus* in the Vatican and the *Agias* at Delphi. Our knowledge of Lysippus comes from writings about him. H. Lloyd Stow

LYSOZYME. See Enzyme.

LYTE, HENRY FRANCIS (1793-1847), a British clergyman, is best remembered for the hymns he wrote, including "Abide with Me" and "Jesus, I My Cross Have Taken." For 25 years, he served as clergyman in the small fishing village of Lower Brixham on the Devonshire coast. There, he developed a Sunday school of 800 students and trained more than 70 teachers. He worked constantly, preaching and visiting the members of his parish. He is said to have written "hymns for his little ones, hymns for fishermen, and hymns for sufferers". See Hymn (Some World-Famous Hymns).

Lyte was born in Roxburghshire, Scotland. He attended Trinity College in Dublin, and was ordained as an Anglican minister at the age of 21. Arthur L. Rich

LYTTON. See Bulwer-Lytton.